

Stress Analysis Report



Analyzed File:	Gawangan Chiller PIK.iam
Autodesk Inventor Version:	2015 (Build 190159000, 159)
Creation Date:	11/27/2017, 7:04 PM
Simulation Author:	Erwiyan Fajar Ansori
Summary:	

Project Info (iProperties)

Summary

Author	Erwiyan Fajar Ansori
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Project

Part Number	Gawangan Chiller PIK
Designer	Erwiyan Fajar Ansori
Cost	\$0.00
Date Created	11/27/2017

Status

Design Status	WorkInProgress
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Physical

Mass	349.376 kg
Area	13372200 mm ²
Volume	52434400 mm ³
Center of Gravity	x=1598.25 mm y=193.783 mm z=3157.37 mm

Note: Physical values could be different from Physical values used by FEA reported below.

Simulation:1

General objective and settings:

Design Objective	Single Point
Simulation Type	Static Analysis
Last Modification Date	11/27/2017, 7:02 PM
Detect and Eliminate Rigid Body Modes	No
Separate Stresses Across Contact Surfaces	No
Motion Loads Analysis	No

Mesh settings:

Avg. Element Size (fraction of model diameter)	0.1
Min. Element Size (fraction of avg. size)	0.2
Grading Factor	1.5
Max. Turn Angle	60 deg
Create Curved Mesh Elements	No
Use part based measure for Assembly mesh	Yes

Material(s)

Name	Steel, Carbon	
General	Mass Density	7.85 g/cm ³
	Yield Strength	350 MPa
	Ultimate Tensile Strength	420 MPa
Stress	Young's Modulus	200 GPa
	Poisson's Ratio	0.29 ul
	Shear Modulus	77.5194 GPa
Part Name(s)	UMP 120 x 55 x 7 UMP 120 x 55 x 7 menjadi 2 UMP 120 x 55 x 7 (800 mm) UMP 120 x 55 x 7 (800 mm) UMP 120 x 55 x 7 (800 mm) UMP 120 x 55 x 7 (800 mm) Plate 200 x 150 x 20 mm Plate 200 x 150 x 20 mm Plate 200 x 150 x 20 mm Plate 200 x 150 x 20 mm UMP 120 x 55 x 7 (1500 mm) UMP 120 x 55 x 7 (1500 mm)	

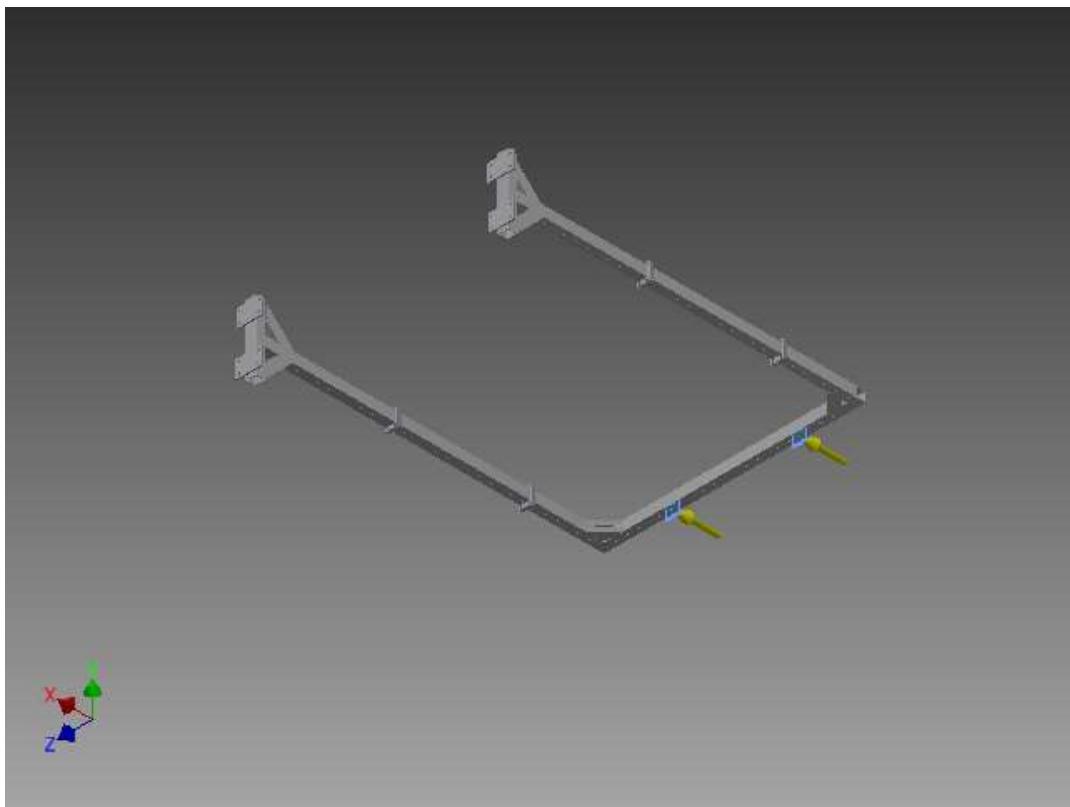
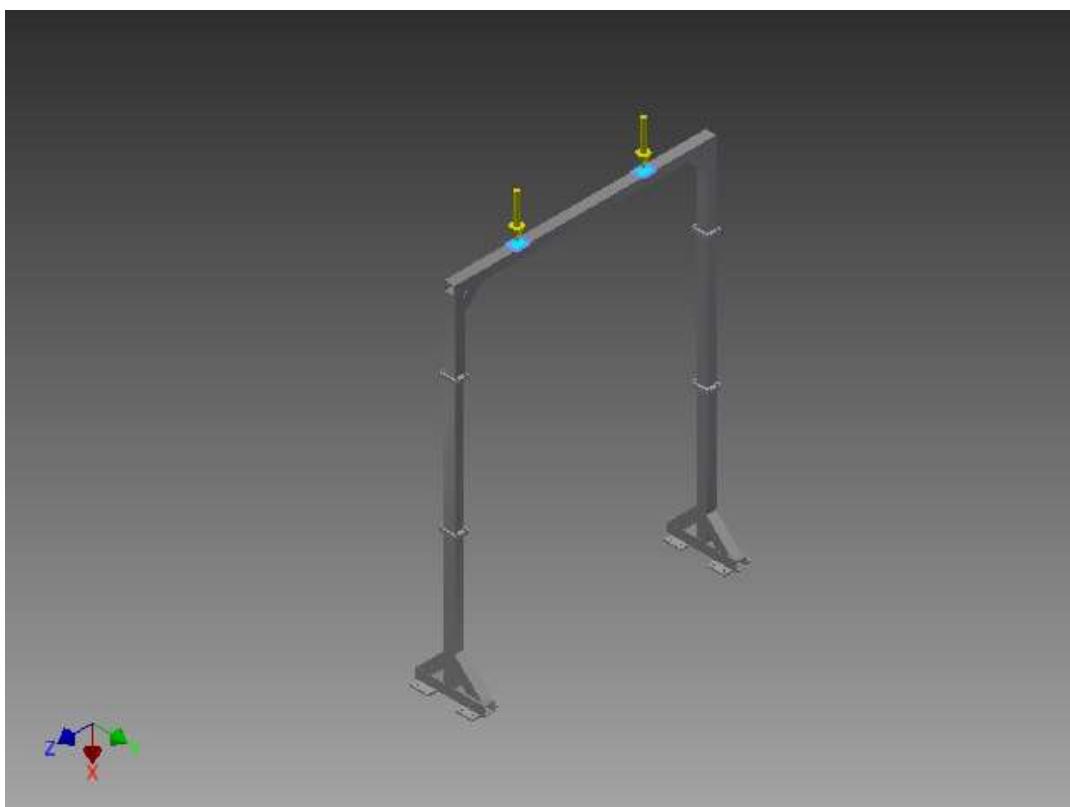
UMP 120 x 55 x 7 (1500 mm)
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UMP 120 x 55 x 7 (1500 mm)
UMP 120 x 55 x 7 (1500 mm)
UMP 120 x 55 x 7 (800 mm)
UMP 120 x 55 x 7 (800 mm)
UMP 120 x 55 x 7 (800 mm)
UMP 120 x 55 x 7 (800 mm)
Plate 300 x 200 x 20 mm
Plate 300 x 200 x 20 mm
Plate 300 x 200 x 20 mm
Plate 300 x 200 x 20 mm
UMP 120 x 55 x 7 (500 mm) 2
UMP 120 x 55 x 7 (500 mm) 2
UMP 120 x 55 x 7 (500 mm) 2
UMP 120 x 55 x 7 (500 mm) 2
UMP 120 x 55 x 7 (800 mm) 2
UMP 120 x 55 x 7 (800 mm) 2
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UMP 120 x 55 x 7 (800 mm) 2

Operating conditions

Force:1

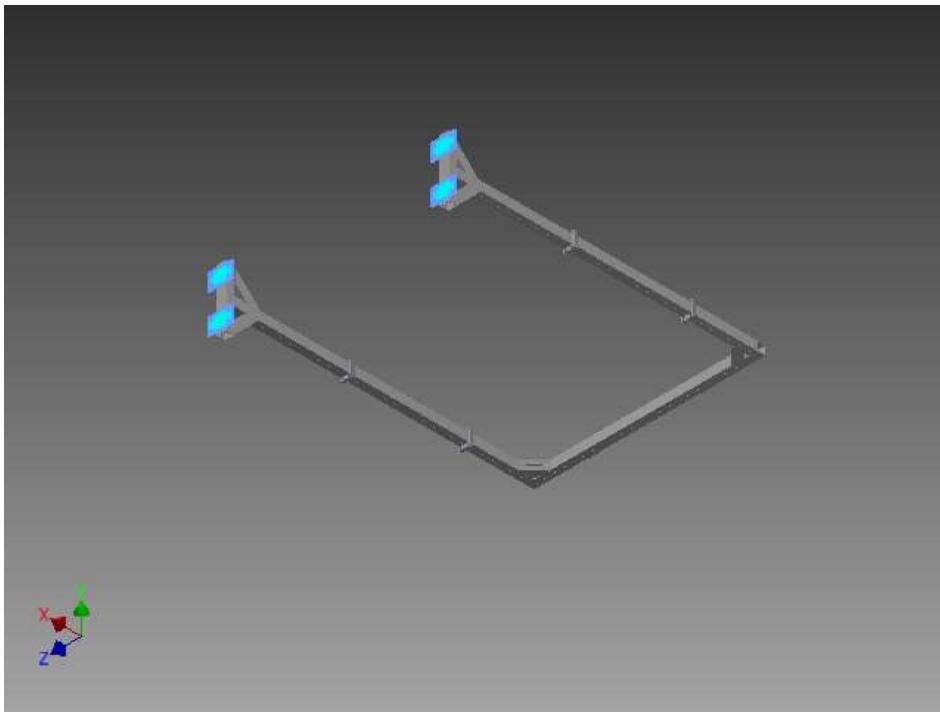
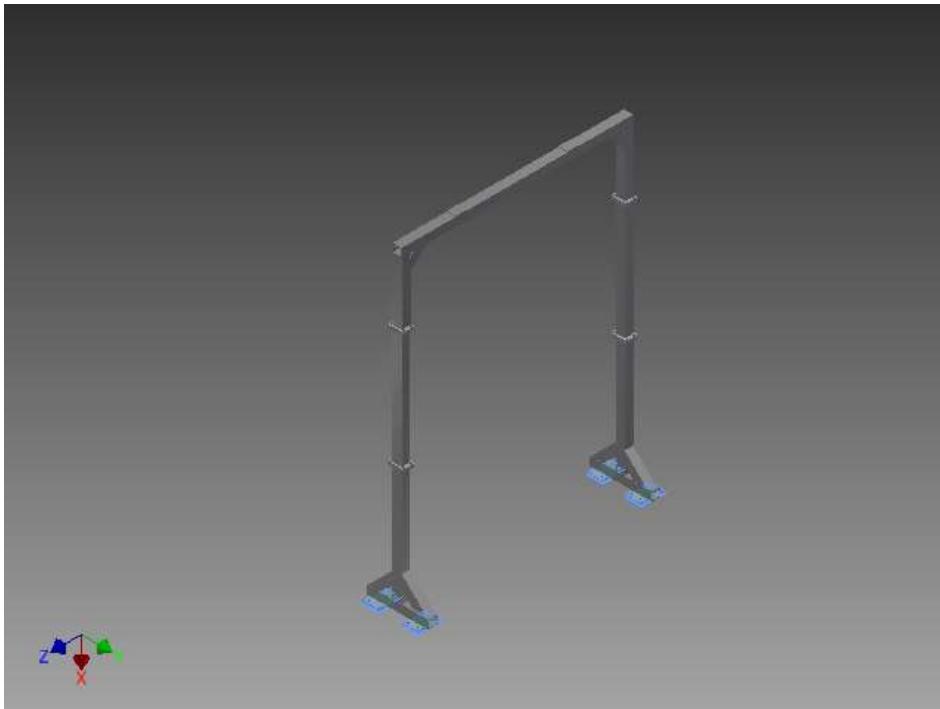
Load Type	Force
Magnitude	150000.000 N
Vector X	150000.000 N
Vector Y	0.000 N
Vector Z	0.000 N

Selected Face(s)



Fixed Constraint:1

Constraint Type	Fixed Constraint
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Selected Face(s)

Contacts (Bonded)

Name	Part Name(s)
Bonded:1	UMP 120 x 55 x 7:1 UMP 120 x 55 x 7 menjadi 2:1
Bonded:2	UMP 120 x 55 x 7:1 UMP 120 x 55 x 7 menjadi 2:1
Bonded:3	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (800 mm):1
Bonded:4	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (800 mm):2
Bonded:5	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (800 mm):3
Bonded:6	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (800 mm):4
Bonded:7	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (500 mm) 2:2
Bonded:8	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (500 mm) 2:3
Bonded:9	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (500 mm) 2:4
Bonded:10	UMP 120 x 55 x 7 menjadi 2:1 UMP 120 x 55 x 7 (500 mm) 2:5
Bonded:11	UMP 120 x 55 x 7 (800 mm):1 UMP 120 x 55 x 7 (800 mm):2
Bonded:12	UMP 120 x 55 x 7 (800 mm):1 UMP 120 x 55 x 7 (800 mm):2
Bonded:13	UMP 120 x 55 x 7 (800 mm):1 Plate 200 x 150 x 20 mm:1
Bonded:14	UMP 120 x 55 x 7 (800 mm):1 UMP 120 x 55 x 7 (500 mm) 2:3
Bonded:15	UMP 120 x 55 x 7 (800 mm):1 UMP 120 x 55 x 7 (500 mm) 2:5
Bonded:16	UMP 120 x 55 x 7 (800 mm):2 Plate 200 x 150 x 20 mm:1
Bonded:17	UMP 120 x 55 x 7 (800 mm):3 UMP 120 x 55 x 7 (800 mm):4
Bonded:18	UMP 120 x 55 x 7 (800 mm):3 UMP 120 x 55 x 7 (800 mm):4
Bonded:19	UMP 120 x 55 x 7 (800 mm):3

	Plate 200 x 150 x 20 mm:2
Bonded:20	UMP 120 x 55 x 7 (800 mm):3 UMP 120 x 55 x 7 (500 mm) 2:2
Bonded:21	UMP 120 x 55 x 7 (800 mm):3 UMP 120 x 55 x 7 (500 mm) 2:4
Bonded:22	UMP 120 x 55 x 7 (800 mm):4 Plate 200 x 150 x 20 mm:2
Bonded:23	Plate 200 x 150 x 20 mm:1 Plate 200 x 150 x 20 mm:3
Bonded:24	Plate 200 x 150 x 20 mm:2 Plate 200 x 150 x 20 mm:4
Bonded:25	Plate 200 x 150 x 20 mm:3 UMP 120 x 55 x 7 (1500 mm):1
Bonded:26	Plate 200 x 150 x 20 mm:3 UMP 120 x 55 x 7 (1500 mm):2
Bonded:27	Plate 200 x 150 x 20 mm:4 UMP 120 x 55 x 7 (1500 mm):3
Bonded:28	Plate 200 x 150 x 20 mm:4 UMP 120 x 55 x 7 (1500 mm):4
Bonded:29	UMP 120 x 55 x 7 (1500 mm):1 UMP 120 x 55 x 7 (1500 mm):2
Bonded:30	UMP 120 x 55 x 7 (1500 mm):1 UMP 120 x 55 x 7 (1500 mm):2
Bonded:31	UMP 120 x 55 x 7 (1500 mm):1 Plate 200 x 150 x 20 mm:5
Bonded:32	UMP 120 x 55 x 7 (1500 mm):2 Plate 200 x 150 x 20 mm:5
Bonded:33	UMP 120 x 55 x 7 (1500 mm):3 UMP 120 x 55 x 7 (1500 mm):4
Bonded:34	UMP 120 x 55 x 7 (1500 mm):3 UMP 120 x 55 x 7 (1500 mm):4
Bonded:35	UMP 120 x 55 x 7 (1500 mm):3 Plate 200 x 150 x 20 mm:6
Bonded:36	UMP 120 x 55 x 7 (1500 mm):4 Plate 200 x 150 x 20 mm:6
Bonded:37	Plate 200 x 150 x 20 mm:5 Plate 200 x 150 x 20 mm:7
Bonded:38	Plate 200 x 150 x 20 mm:6 Plate 200 x 150 x 20 mm:8

Bonded:39	Plate 200 x 150 x 20 mm:7 UMP 120 x 55 x 7 (1500 mm):5
Bonded:40	Plate 200 x 150 x 20 mm:7 UMP 120 x 55 x 7 (1500 mm):6
Bonded:41	Plate 200 x 150 x 20 mm:8 UMP 120 x 55 x 7 (1500 mm):7
Bonded:42	Plate 200 x 150 x 20 mm:8 UMP 120 x 55 x 7 (1500 mm):8
Bonded:43	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (1500 mm):6
Bonded:44	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (1500 mm):6
Bonded:45	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (800 mm):5
Bonded:46	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (800 mm) 2:1
Bonded:47	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (800 mm) 2:3
Bonded:48	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (800 mm) 2:7
Bonded:49	UMP 120 x 55 x 7 (1500 mm):5 UMP 120 x 55 x 7 (800 mm) 2:9
Bonded:50	UMP 120 x 55 x 7 (1500 mm):6 UMP 120 x 55 x 7 (800 mm):5
Bonded:51	UMP 120 x 55 x 7 (1500 mm):6 UMP 120 x 55 x 7 (800 mm) 2:1
Bonded:52	UMP 120 x 55 x 7 (1500 mm):6 UMP 120 x 55 x 7 (800 mm) 2:3
Bonded:53	UMP 120 x 55 x 7 (1500 mm):6 UMP 120 x 55 x 7 (800 mm) 2:7
Bonded:54	UMP 120 x 55 x 7 (1500 mm):6 UMP 120 x 55 x 7 (800 mm) 2:9
Bonded:55	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (1500 mm):8
Bonded:56	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (1500 mm):8
Bonded:57	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (800 mm):7
Bonded:58	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (800 mm) 2:10

Bonded:59	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (800 mm) 2:6
Bonded:60	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (800 mm) 2:8
Bonded:61	UMP 120 x 55 x 7 (1500 mm):8 UMP 120 x 55 x 7 (800 mm):7
Bonded:62	UMP 120 x 55 x 7 (1500 mm):7 UMP 120 x 55 x 7 (800 mm) 2:11
Bonded:63	UMP 120 x 55 x 7 (1500 mm):8 UMP 120 x 55 x 7 (800 mm) 2:6
Bonded:64	UMP 120 x 55 x 7 (1500 mm):8 UMP 120 x 55 x 7 (800 mm) 2:8
Bonded:65	UMP 120 x 55 x 7 (800 mm):5 UMP 120 x 55 x 7 (800 mm):6
Bonded:66	UMP 120 x 55 x 7 (800 mm):5 UMP 120 x 55 x 7 (800 mm):6
Bonded:67	UMP 120 x 55 x 7 (800 mm):5 UMP 120 x 55 x 7 (800 mm) 2:3
Bonded:68	UMP 120 x 55 x 7 (800 mm):5 UMP 120 x 55 x 7 (800 mm) 2:7
Bonded:69	UMP 120 x 55 x 7 (800 mm):6 Plate 300 x 200 x 20 mm:1
Bonded:70	UMP 120 x 55 x 7 (800 mm):6 Plate 300 x 200 x 20 mm:2
Bonded:71	UMP 120 x 55 x 7 (800 mm):7 UMP 120 x 55 x 7 (800 mm):8
Bonded:72	UMP 120 x 55 x 7 (800 mm):7 UMP 120 x 55 x 7 (800 mm):8
Bonded:73	UMP 120 x 55 x 7 (1500 mm):8 UMP 120 x 55 x 7 (800 mm) 2:10
Bonded:74	UMP 120 x 55 x 7 (800 mm):7 UMP 120 x 55 x 7 (800 mm) 2:6
Bonded:75	UMP 120 x 55 x 7 (800 mm):7 UMP 120 x 55 x 7 (800 mm) 2:8
Bonded:76	UMP 120 x 55 x 7 (800 mm):8 Plate 300 x 200 x 20 mm:3
Bonded:77	UMP 120 x 55 x 7 (800 mm):8 Plate 300 x 200 x 20 mm:4
Bonded:78	UMP 120 x 55 x 7 (800 mm) 2:1 UMP 120 x 55 x 7 (800 mm) 2:9

Bonded:79	UMP 120 x 55 x 7 (800 mm) 2:1 UMP 120 x 55 x 7 (800 mm) 2:9
Bonded:80	UMP 120 x 55 x 7 (800 mm) 2:3 UMP 120 x 55 x 7 (800 mm) 2:7
Bonded:81	UMP 120 x 55 x 7 (800 mm) 2:3 UMP 120 x 55 x 7 (800 mm) 2:7
Bonded:82	UMP 120 x 55 x 7 (800 mm) 2:6 UMP 120 x 55 x 7 (800 mm) 2:8
Bonded:83	UMP 120 x 55 x 7 (800 mm) 2:6 UMP 120 x 55 x 7 (800 mm) 2:8
Bonded:84	UMP 120 x 55 x 7 (1500 mm):8 UMP 120 x 55 x 7 (800 mm) 2:11
Bonded:85	UMP 120 x 55 x 7 (1500 mm):8 UMP 120 x 55 x 7 (800 mm) 2:11
Bonded:86	UMP 120 x 55 x 7 (800 mm) 2:10 UMP 120 x 55 x 7 (800 mm) 2:11
Bonded:87	UMP 120 x 55 x 7 (800 mm) 2:10 UMP 120 x 55 x 7 (800 mm) 2:11
Bonded:88	UMP 120 x 55 x 7 (800 mm) 2:10 UMP 120 x 55 x 7 (800 mm) 2:11
Bonded:89	UMP 120 x 55 x 7 (800 mm) 2:10 UMP 120 x 55 x 7 (800 mm) 2:11

Results

Reaction Force and Moment on Constraints

Constraint Name	Reaction Force		Reaction Moment	
	Magnitude	Component (X,Y,Z)	Magnitude	Component (X,Y,Z)
Fixed Constraint:1	150000 N	-150000 N	1264.18 N m	0 N m
		0 N		0 N m
		0 N		-1264.18 N m

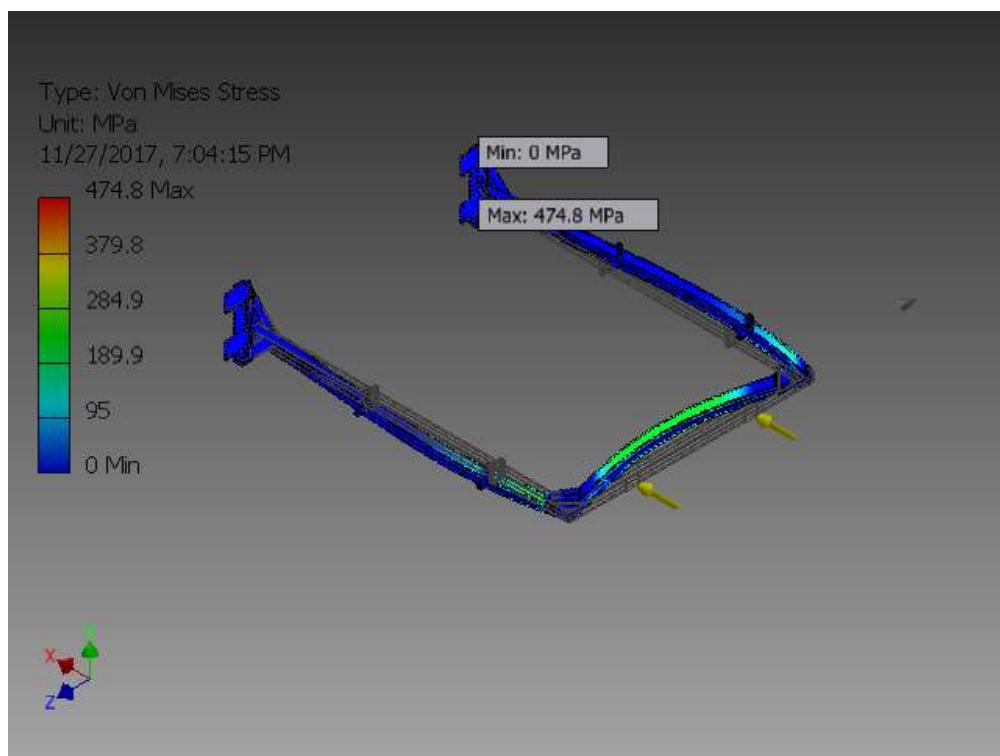
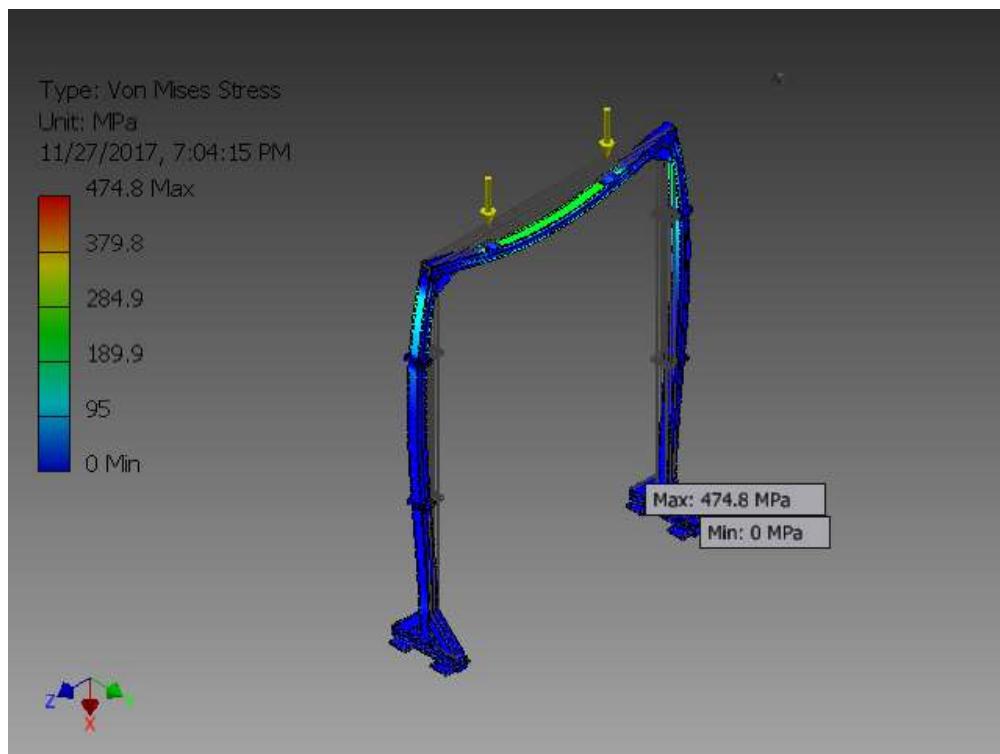
Result Summary

Name	Minimum	Maximum
Volume	52434400 mm ³	
Mass	411.61 kg	
Von Mises Stress	0.00439565 MPa	474.779 MPa
1st Principal Stress	-93.3078 MPa	285.185 MPa

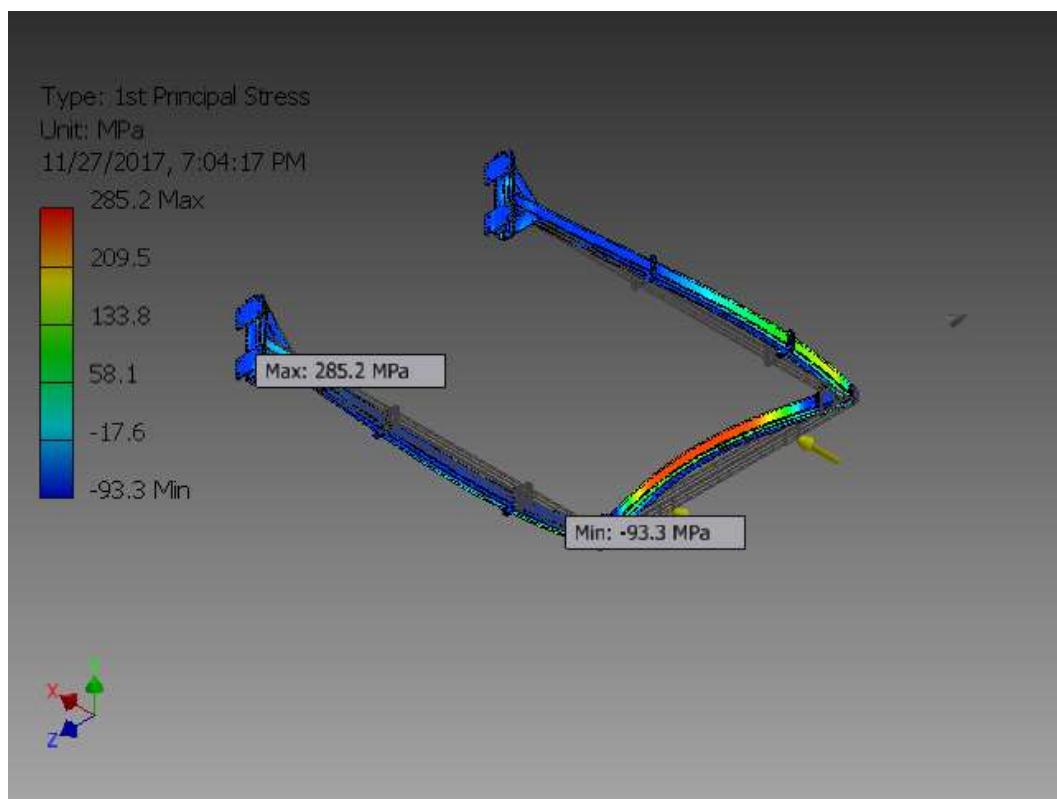
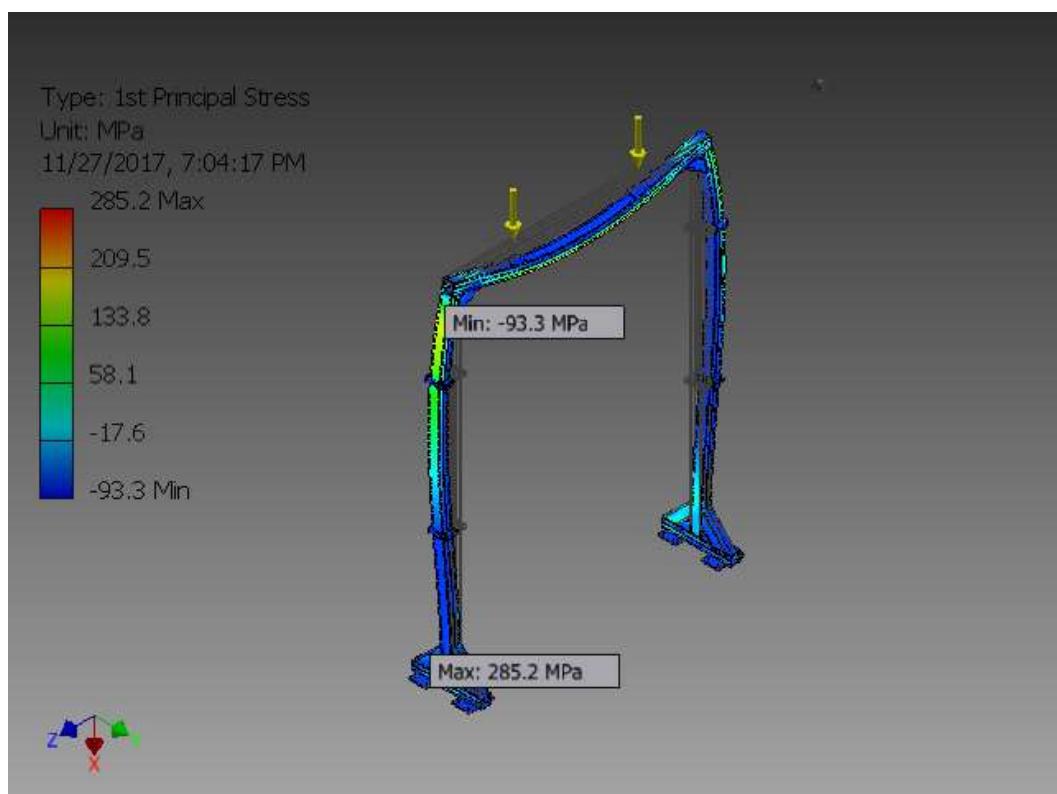
3rd Principal Stress	-509.657 MPa	53.7067 MPa
Displacement	0 mm	21.6621 mm
Safety Factor	0.737185 ul	15 ul
Stress XX	-327.724 MPa	213.668 MPa
Stress XY	-133.149 MPa	235.499 MPa
Stress XZ	-241.385 MPa	149.371 MPa
Stress YY	-298.23 MPa	163.325 MPa
Stress YZ	-129.15 MPa	161.995 MPa
Stress ZZ	-340.306 MPa	265.628 MPa
X Displacement	-0.645272 mm	21.6341 mm
Y Displacement	-0.0347632 mm	1.18715 mm
Z Displacement	-13.9169 mm	13.4255 mm
Equivalent Strain	0.0000000190846 ul	0.00212287 ul
1st Principal Strain	-0.0000127136 ul	0.00158444 ul
3rd Principal Strain	-0.00243491 ul	0.0000199562 ul
Strain XX	-0.00159917 ul	0.00108187 ul
Strain XY	-0.00085881 ul	0.00151897 ul
Strain XZ	-0.00155694 ul	0.000963446 ul
Strain YY	-0.00107121 ul	0.000585056 ul
Strain YZ	-0.000833016 ul	0.00104487 ul
Strain ZZ	-0.00154046 ul	0.00134469 ul
Contact Pressure	0 MPa	4158.04 MPa
Contact Pressure X	-2020.53 MPa	1975.4 MPa
Contact Pressure Y	-536.348 MPa	638.847 MPa
Contact Pressure Z	-3870.06 MPa	3853.31 MPa

Figures

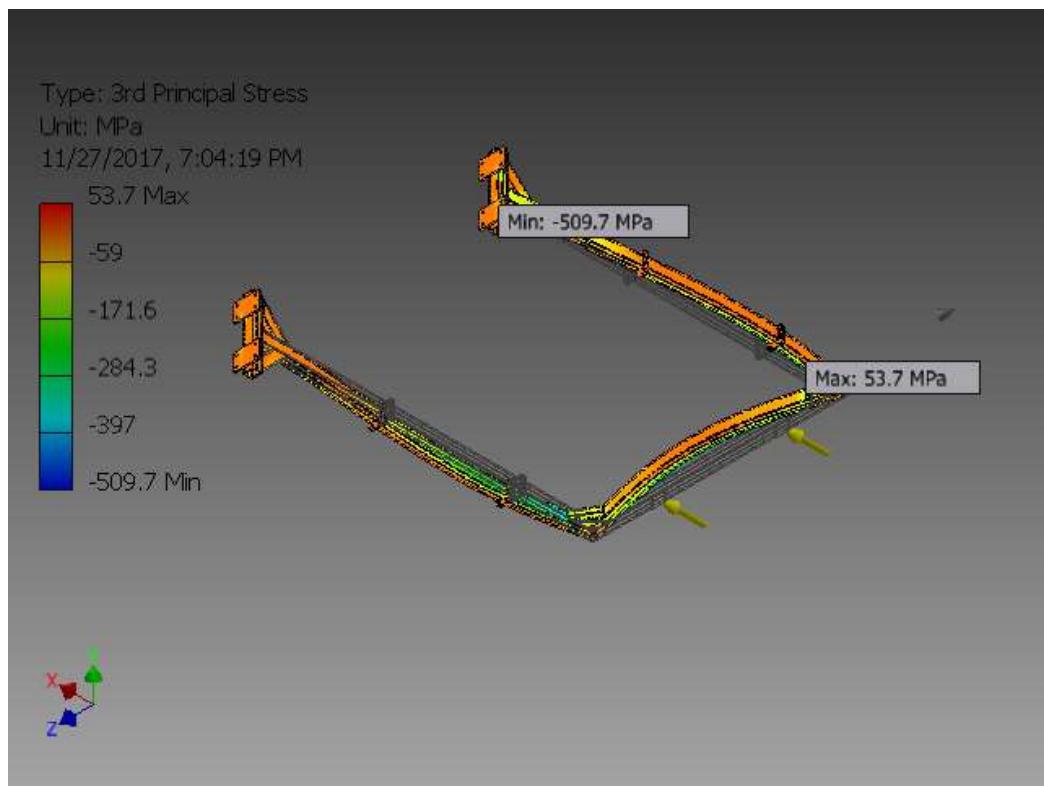
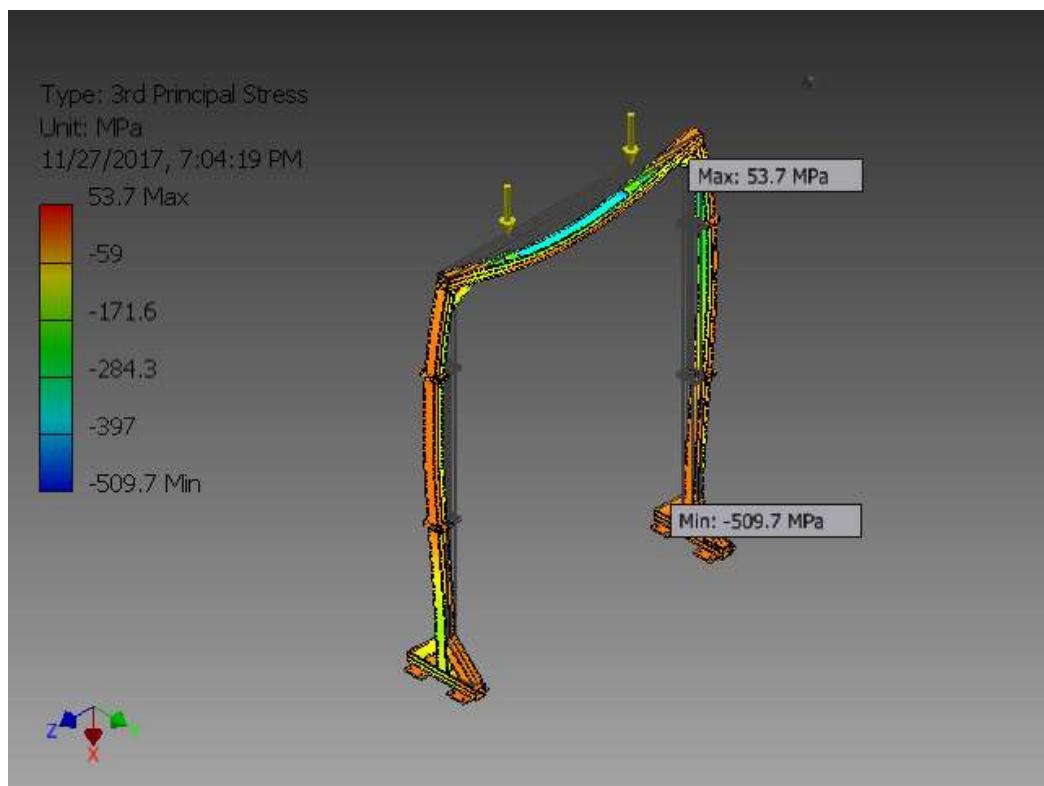
Von Mises Stress



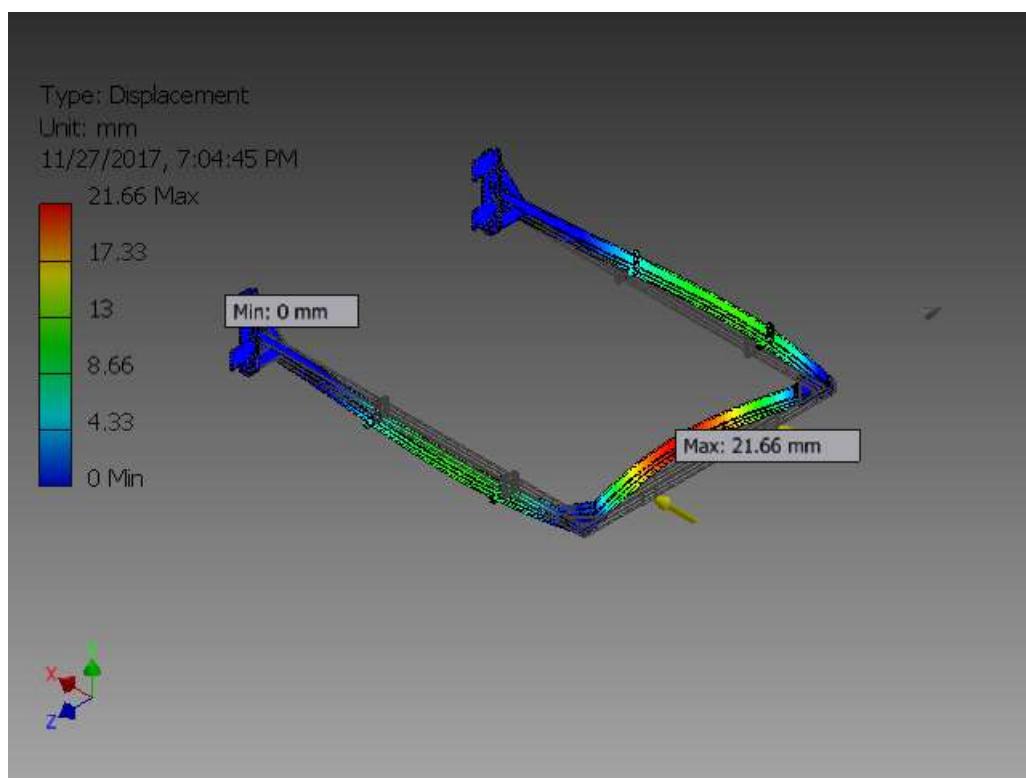
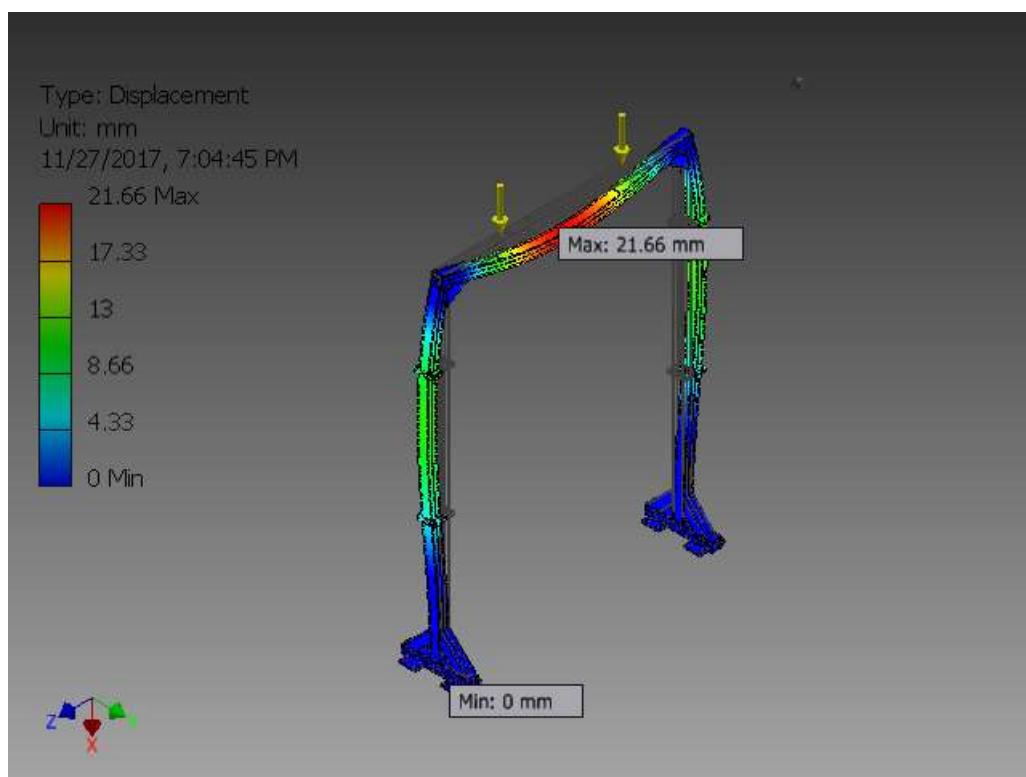
1st Principal Stress



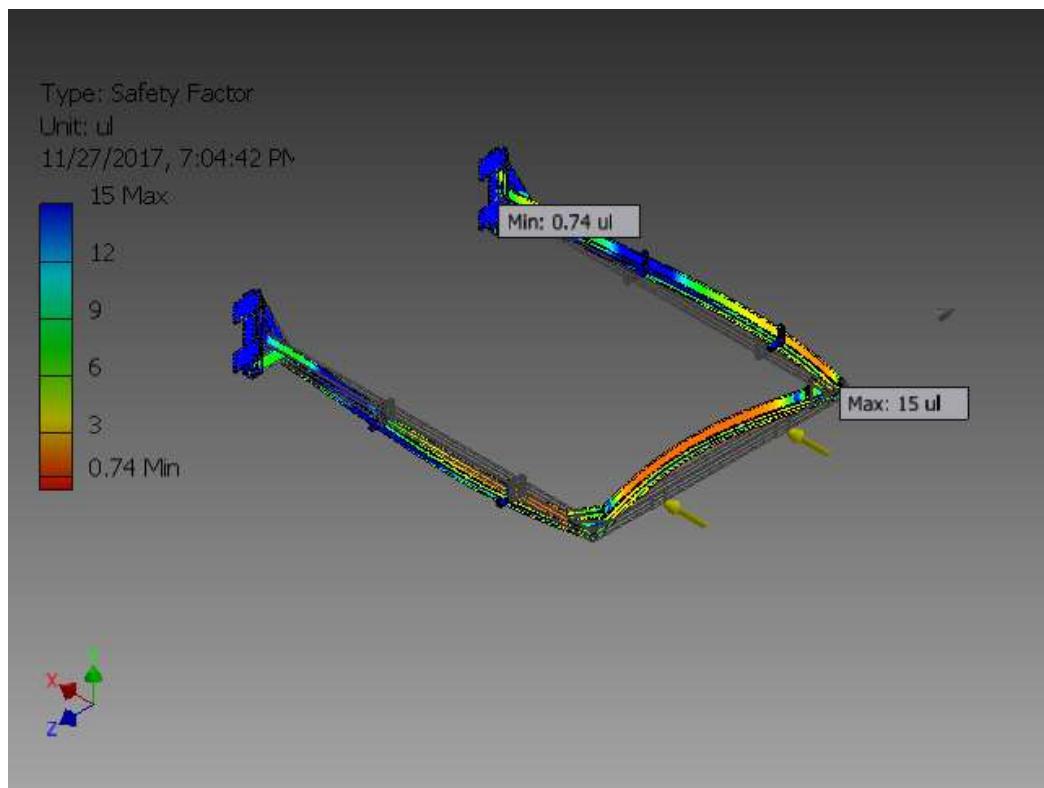
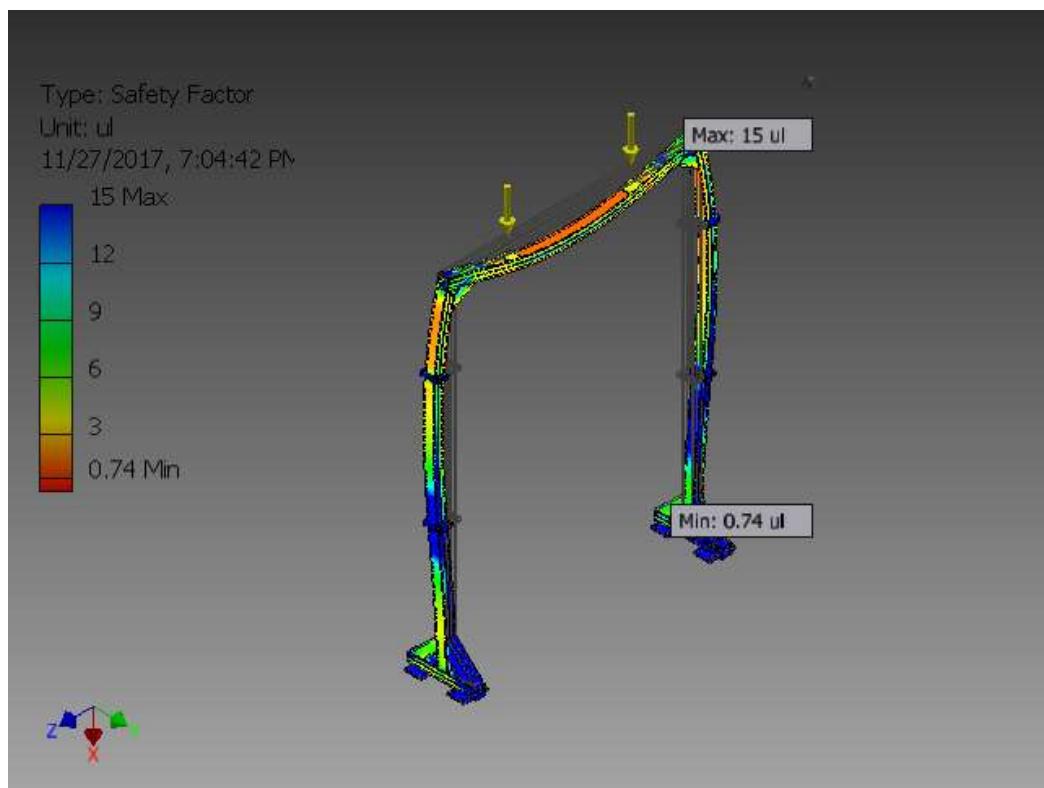
3rd Principal Stress



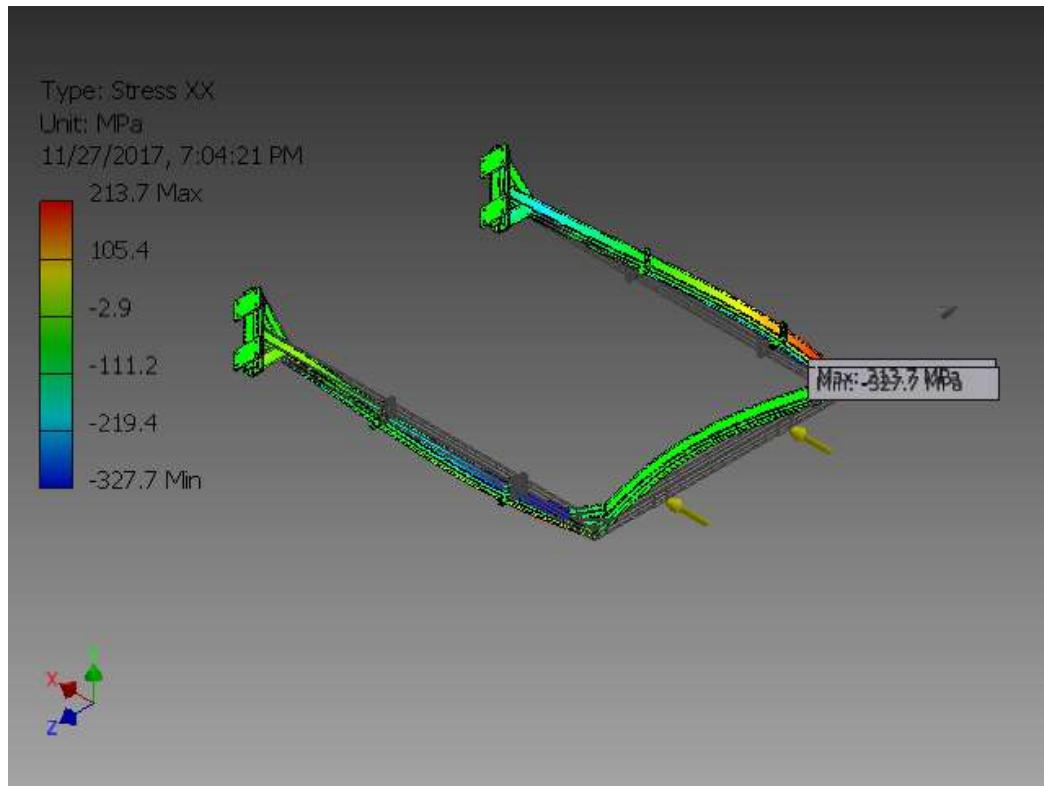
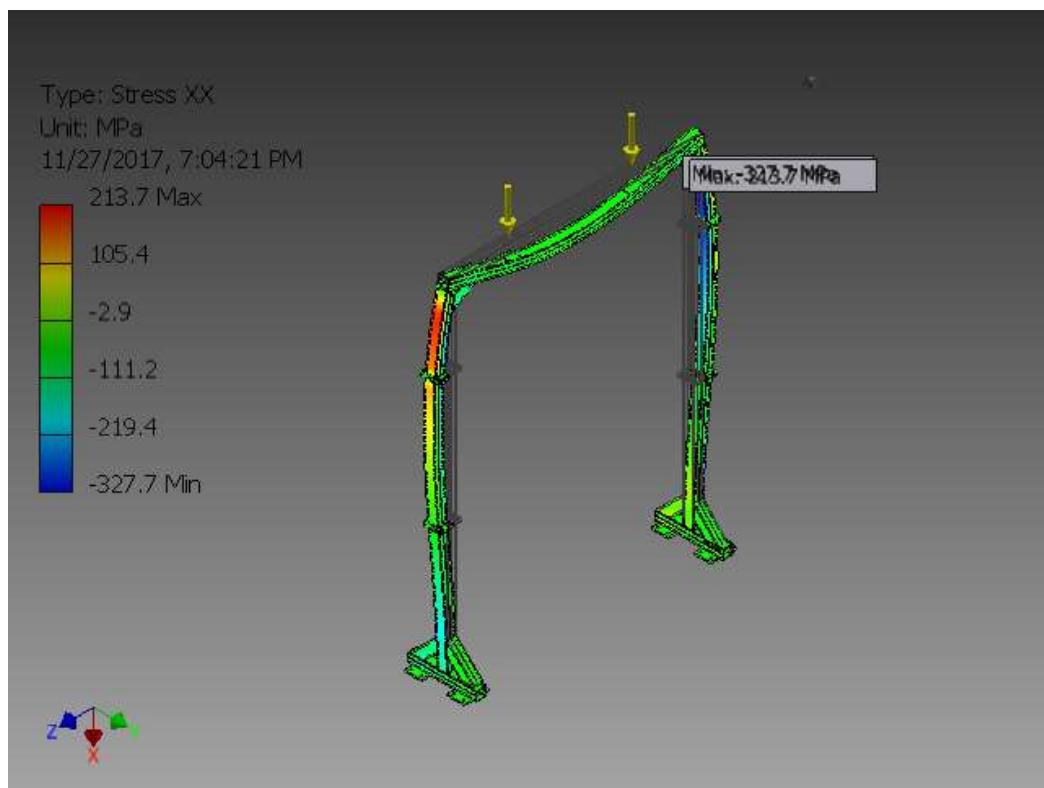
Displacement



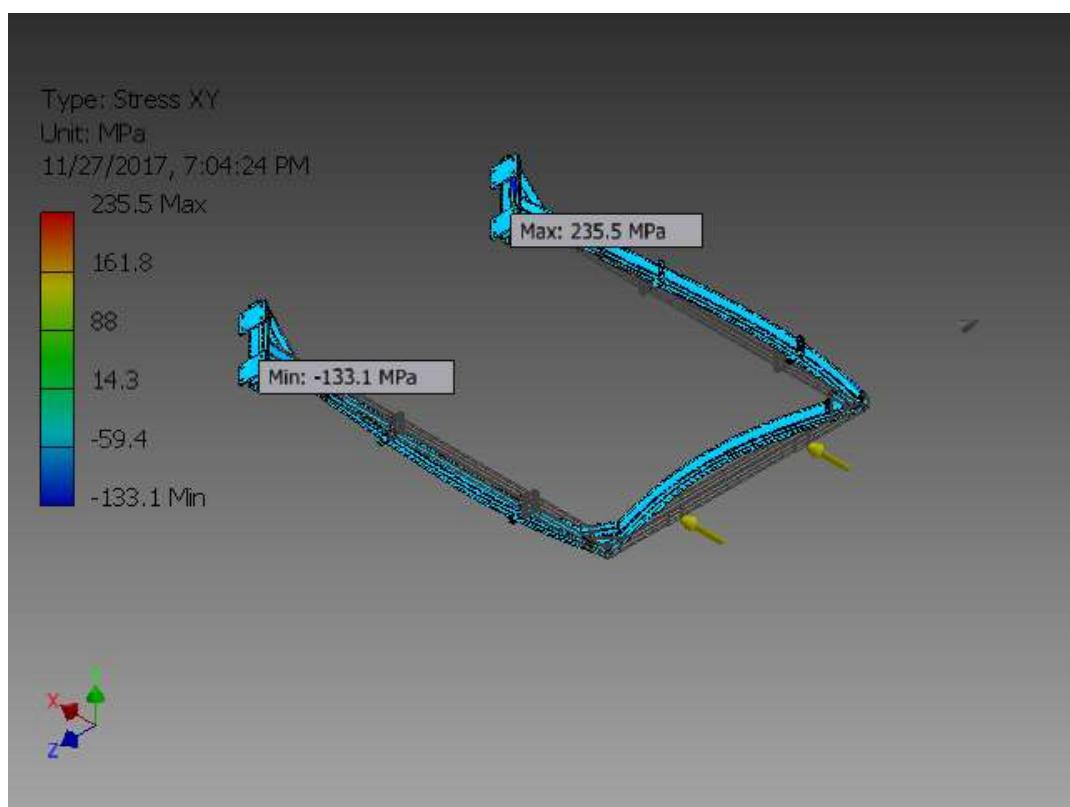
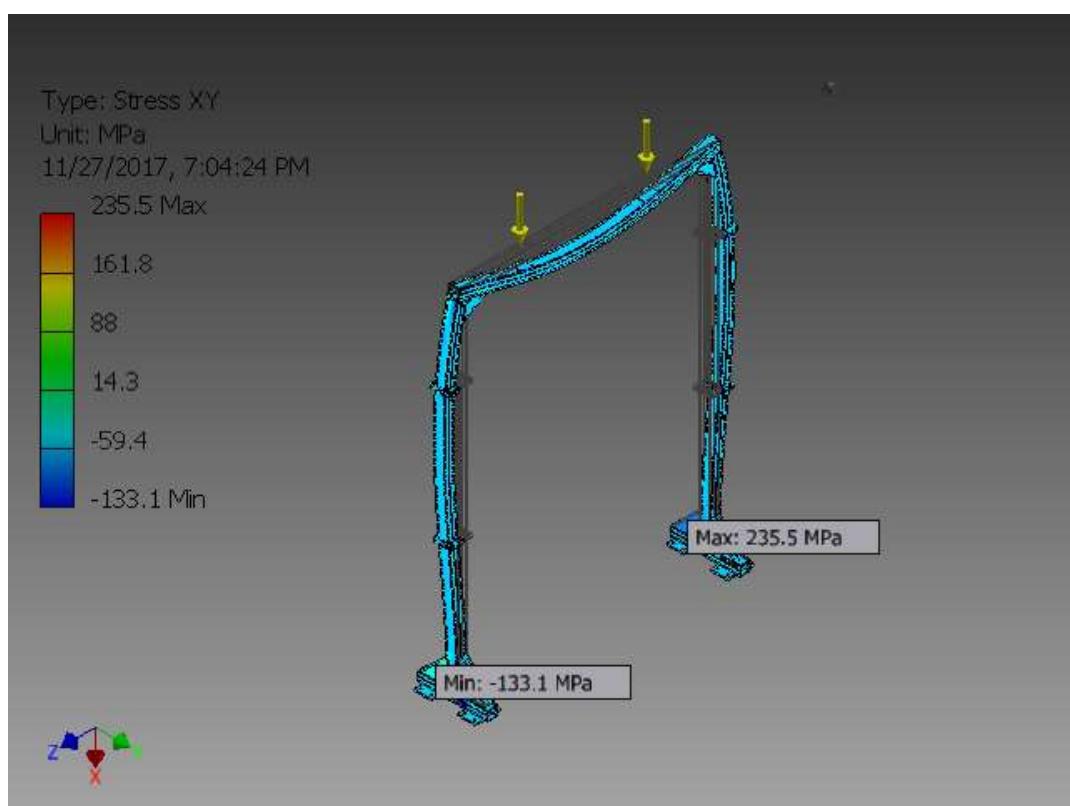
Safety Factor



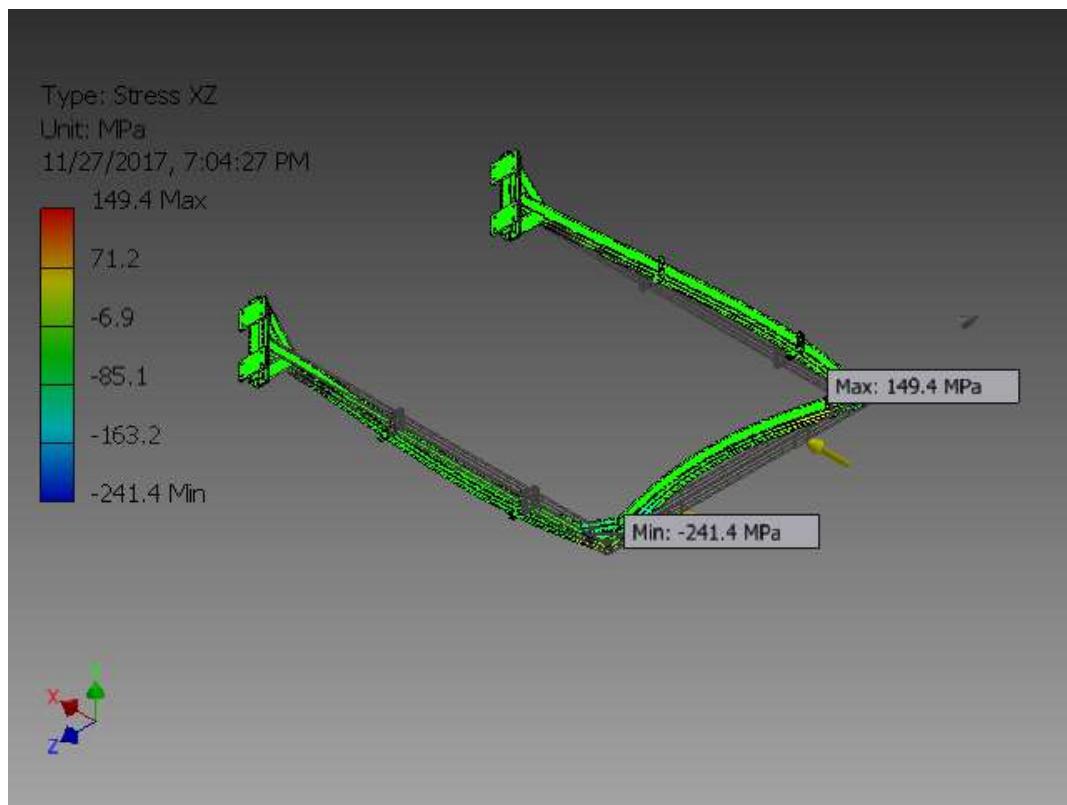
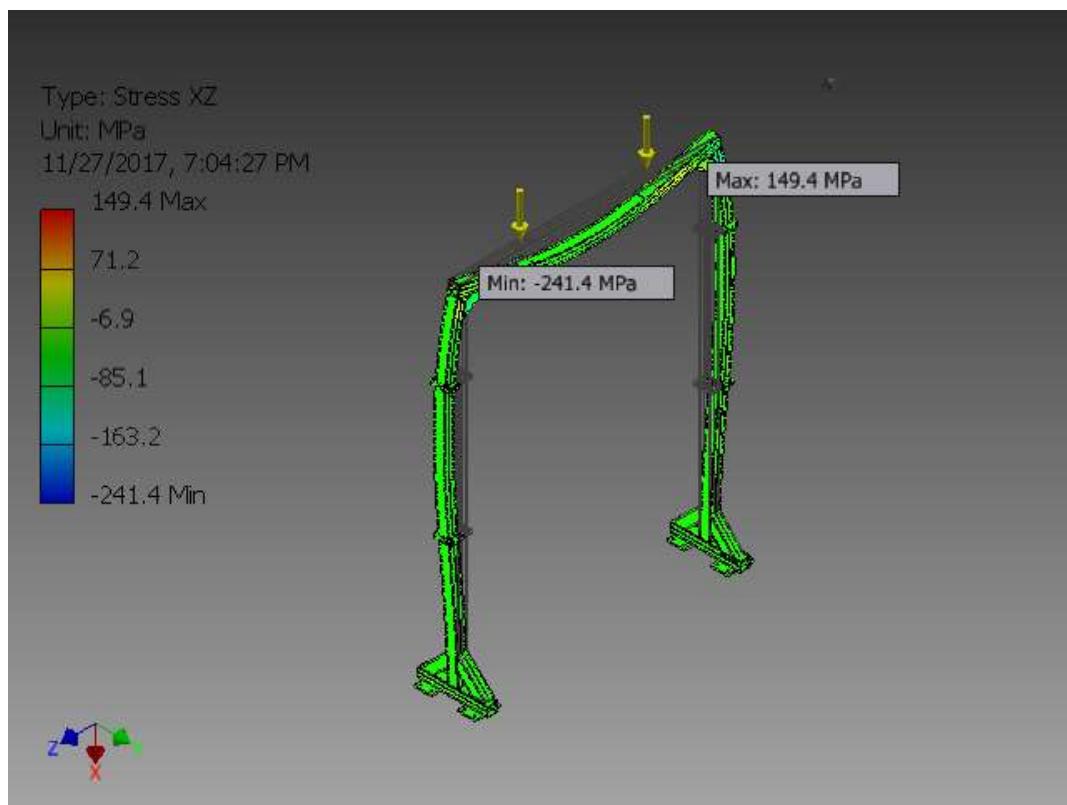
Stress XX



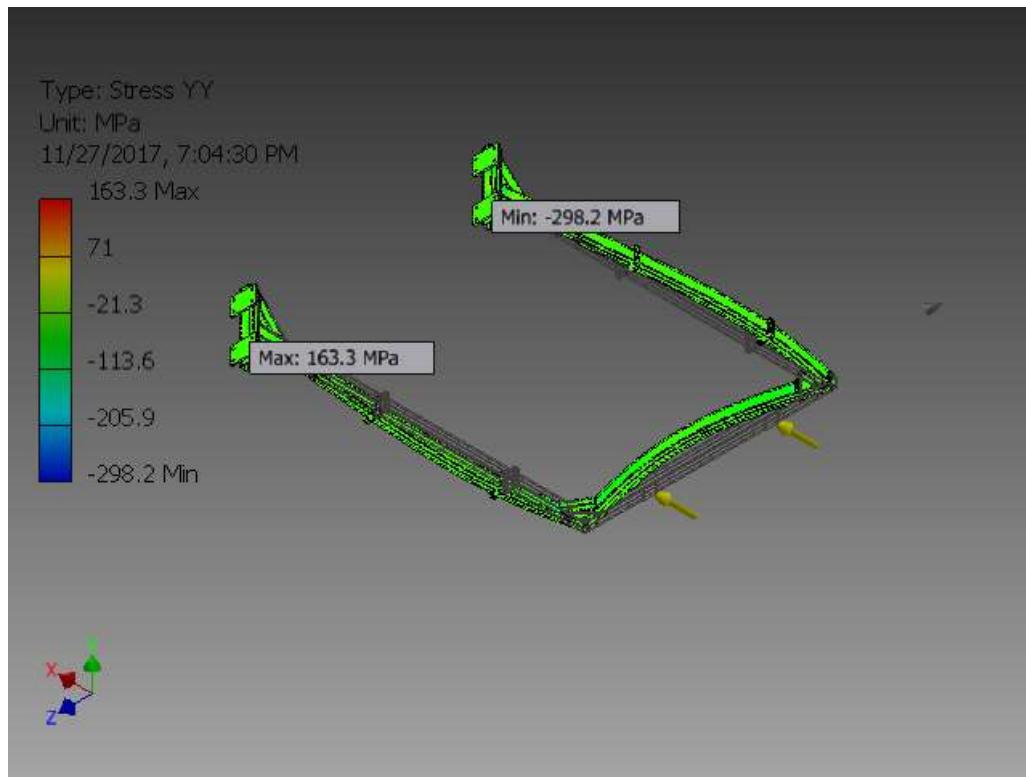
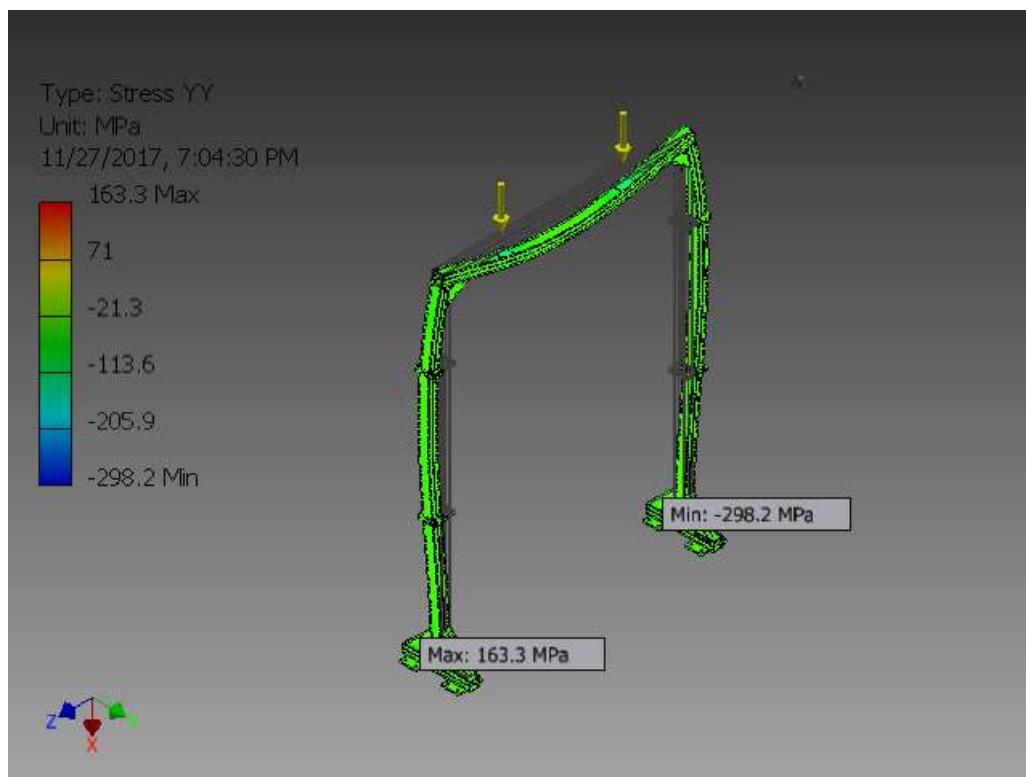
Stress XY



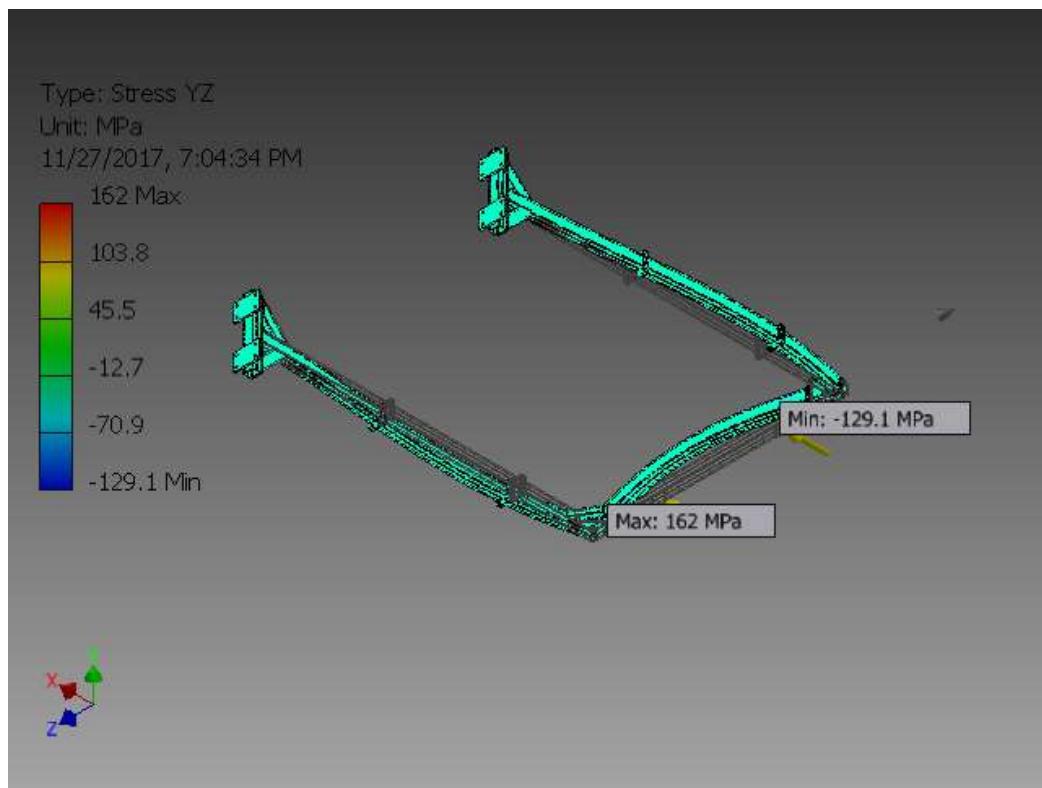
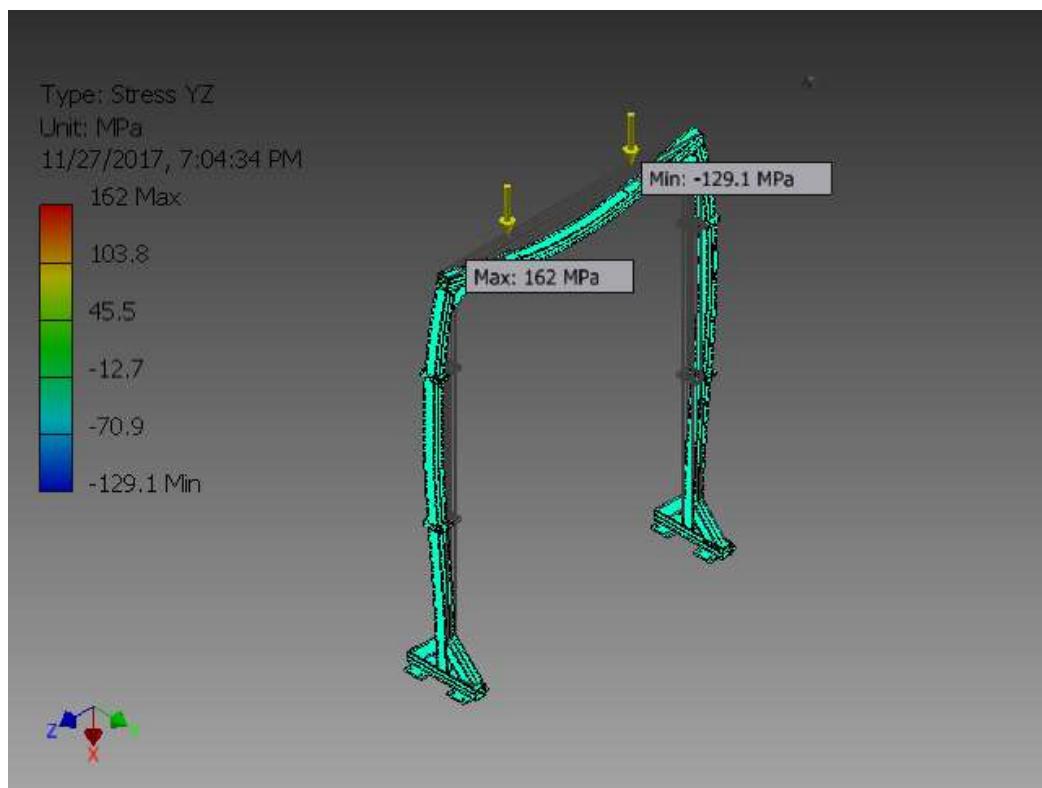
Stress XZ



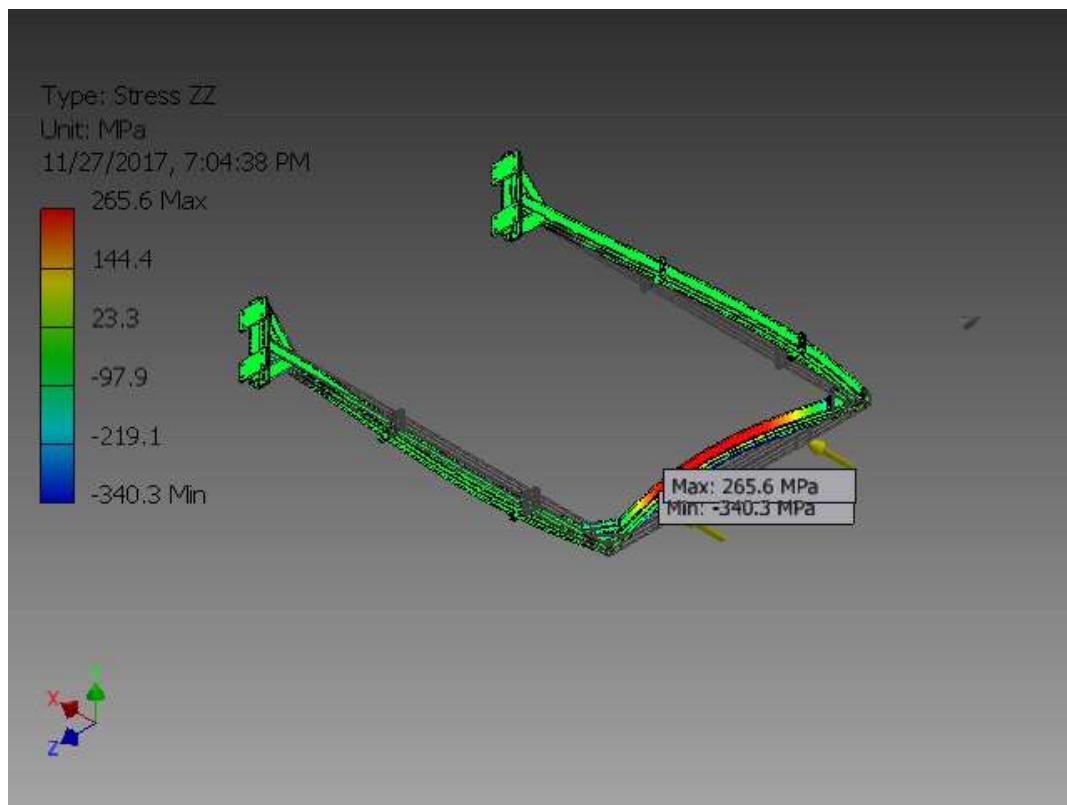
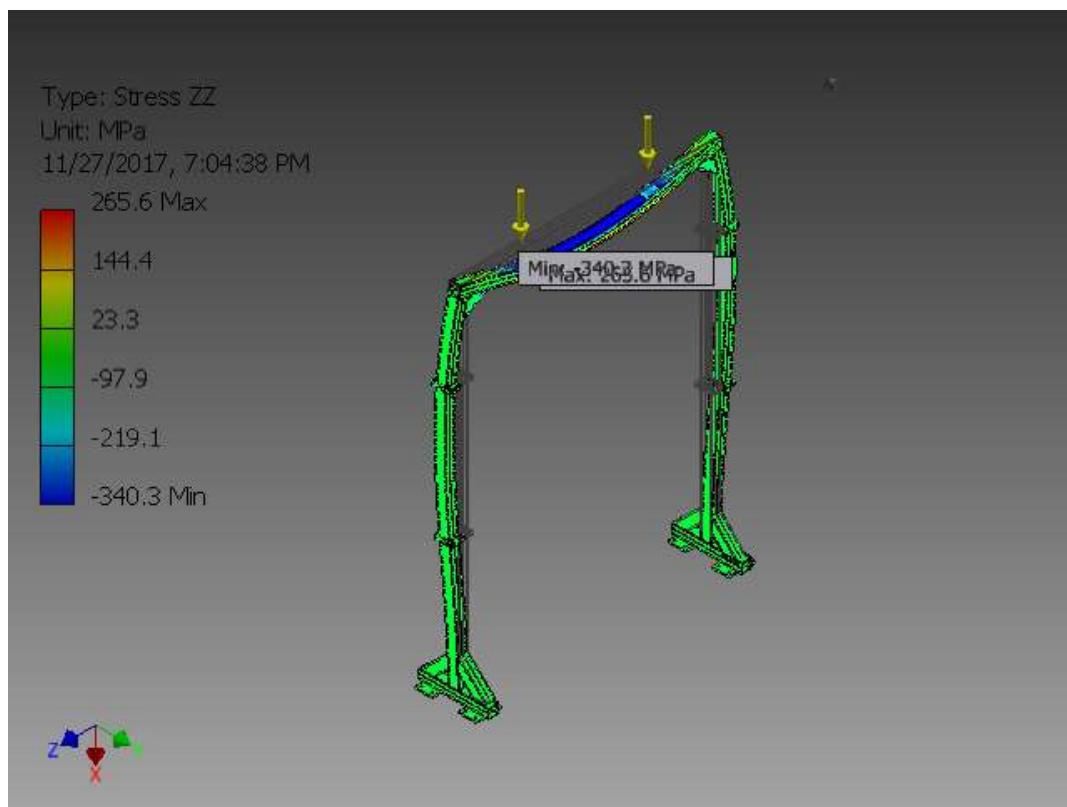
Stress YY



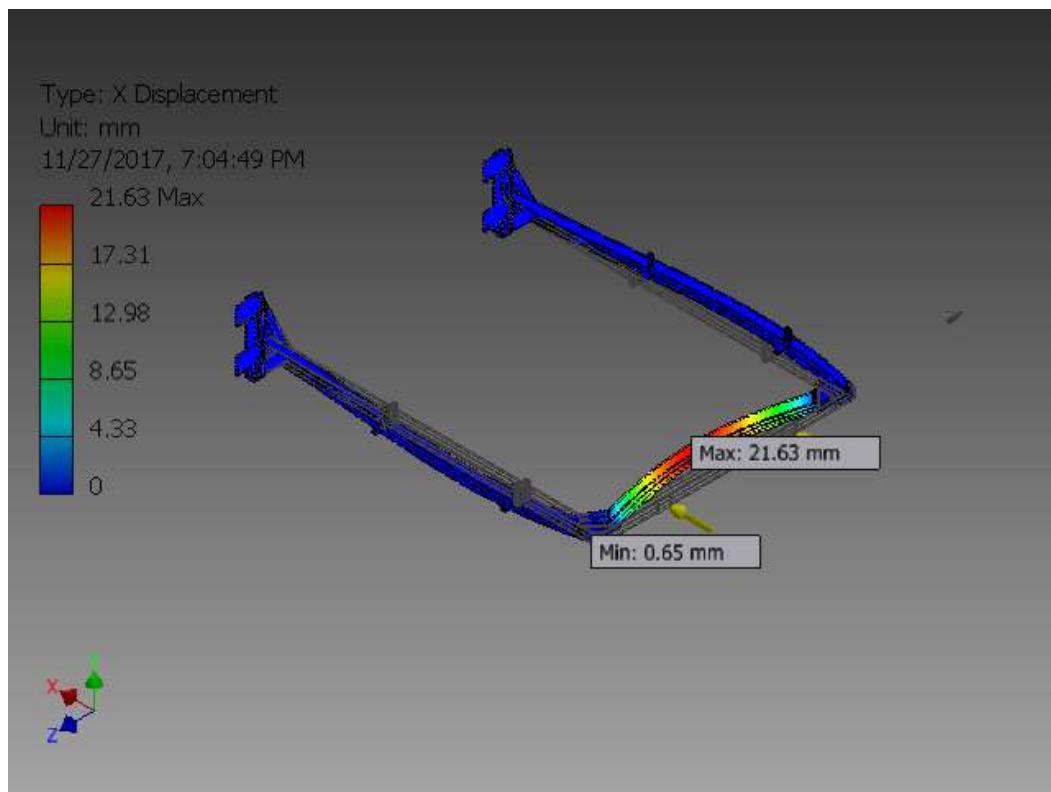
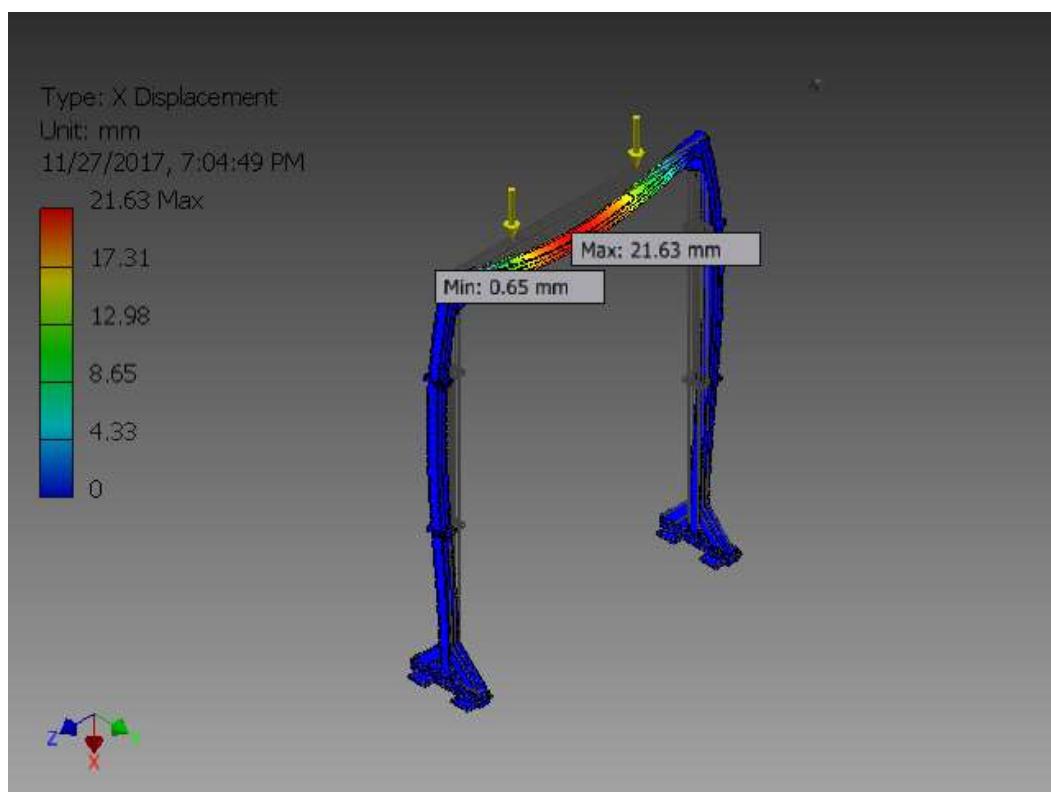
Stress YZ



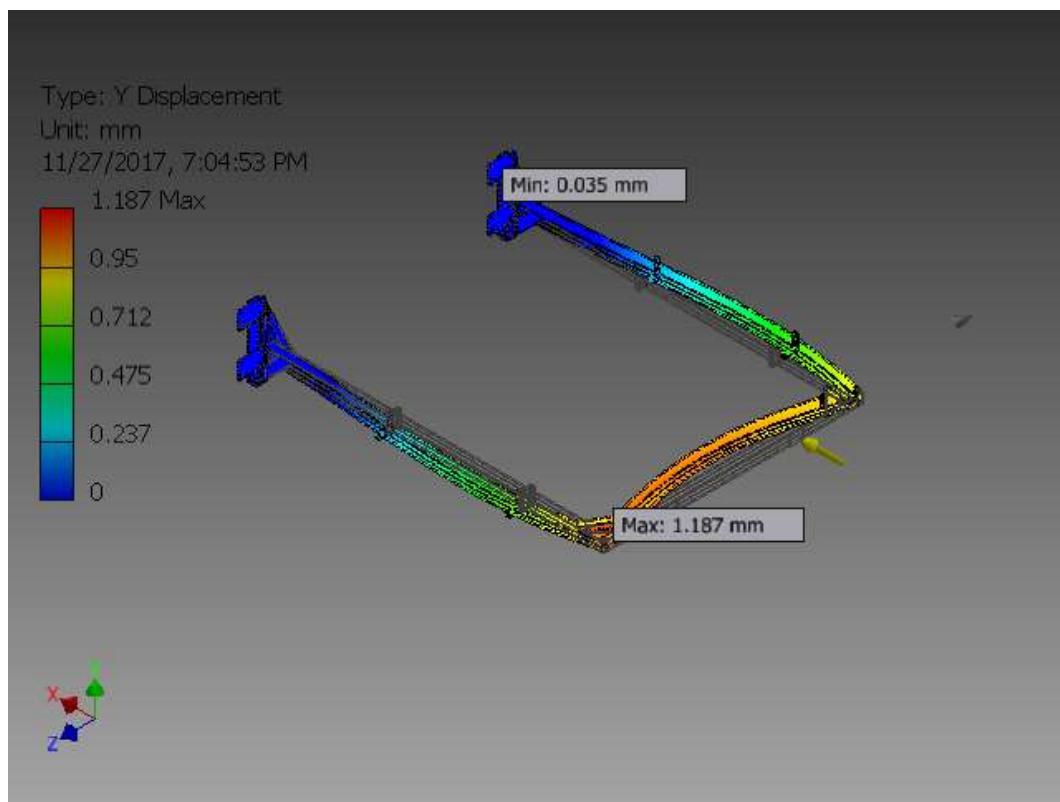
Stress ZZ



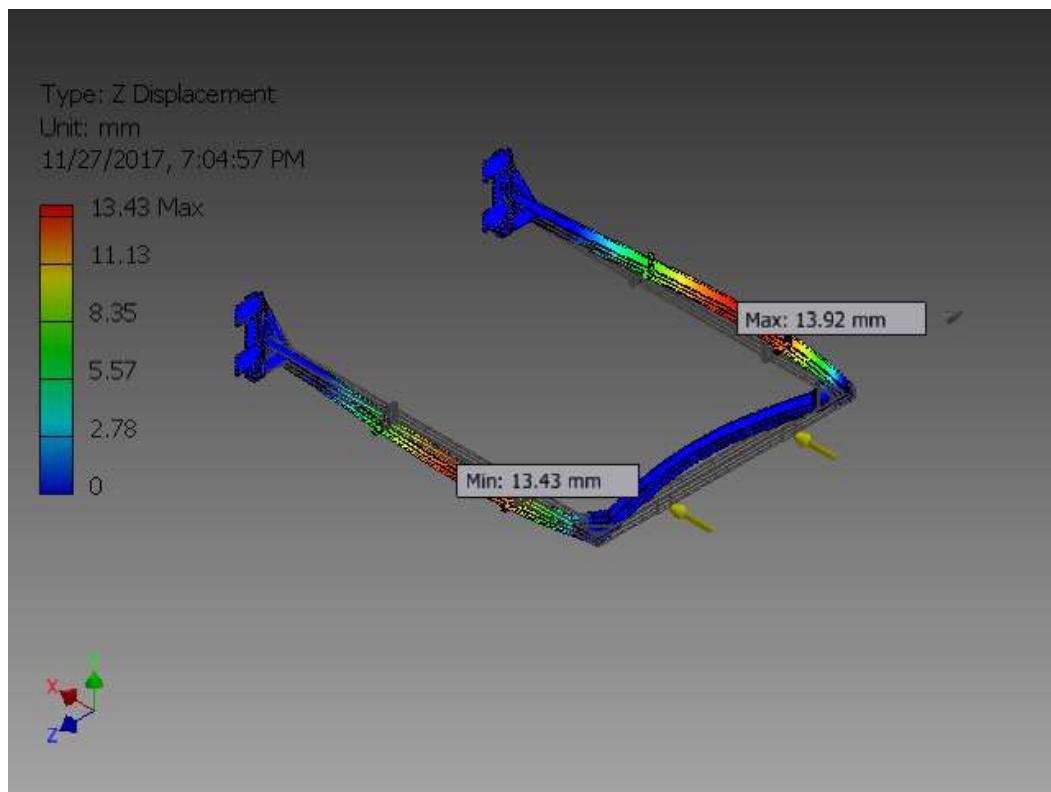
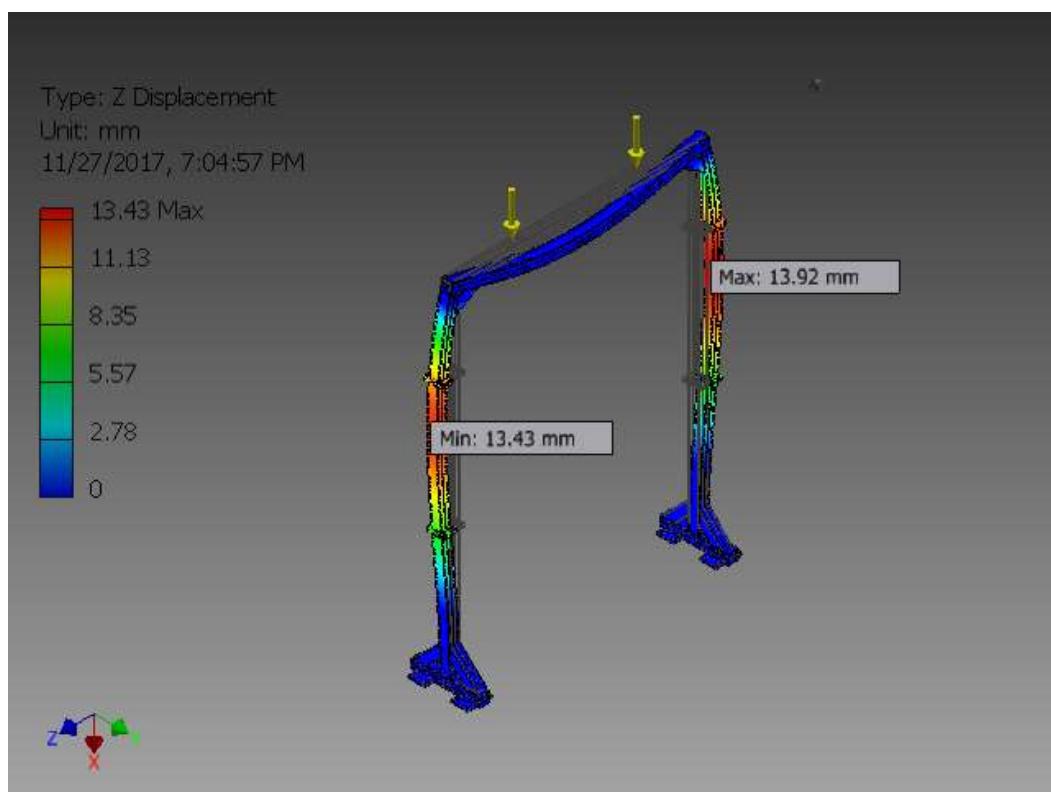
X Displacement



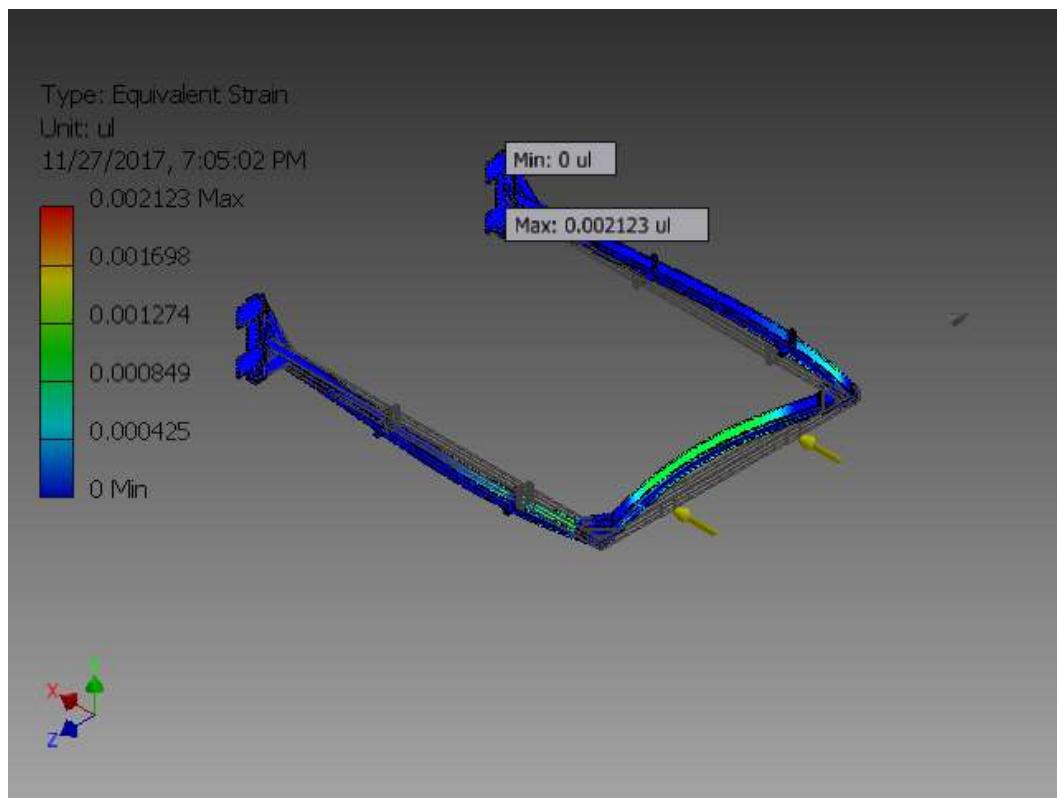
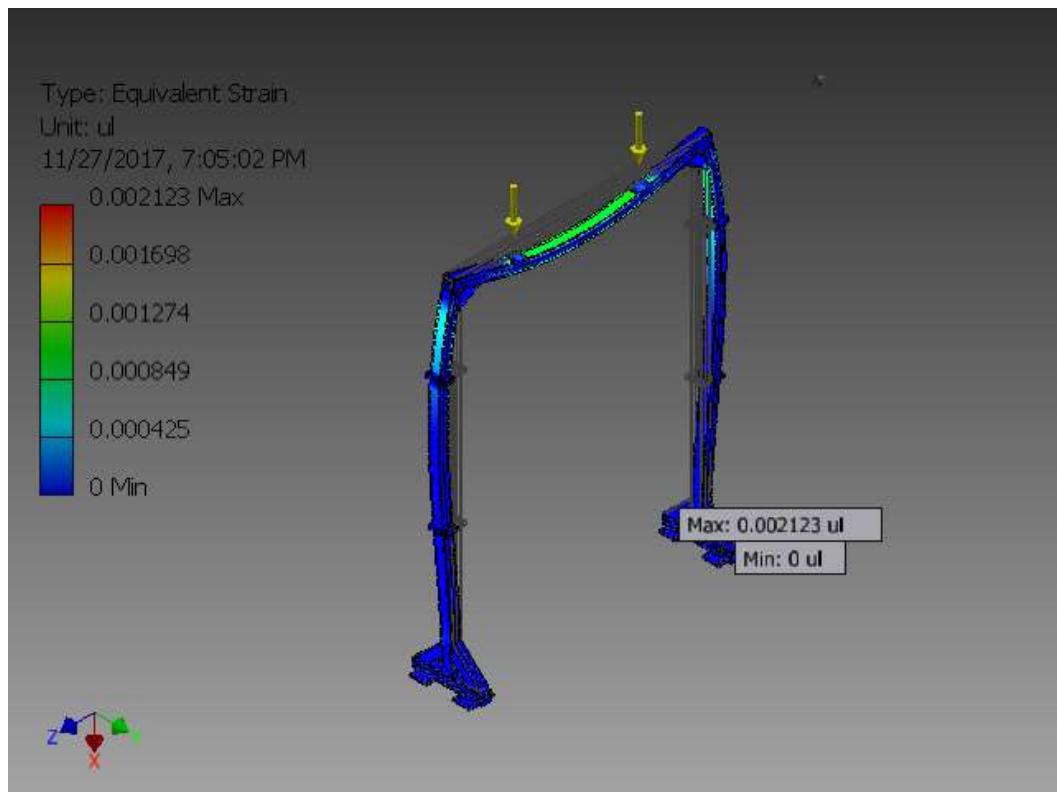
Y Displacement



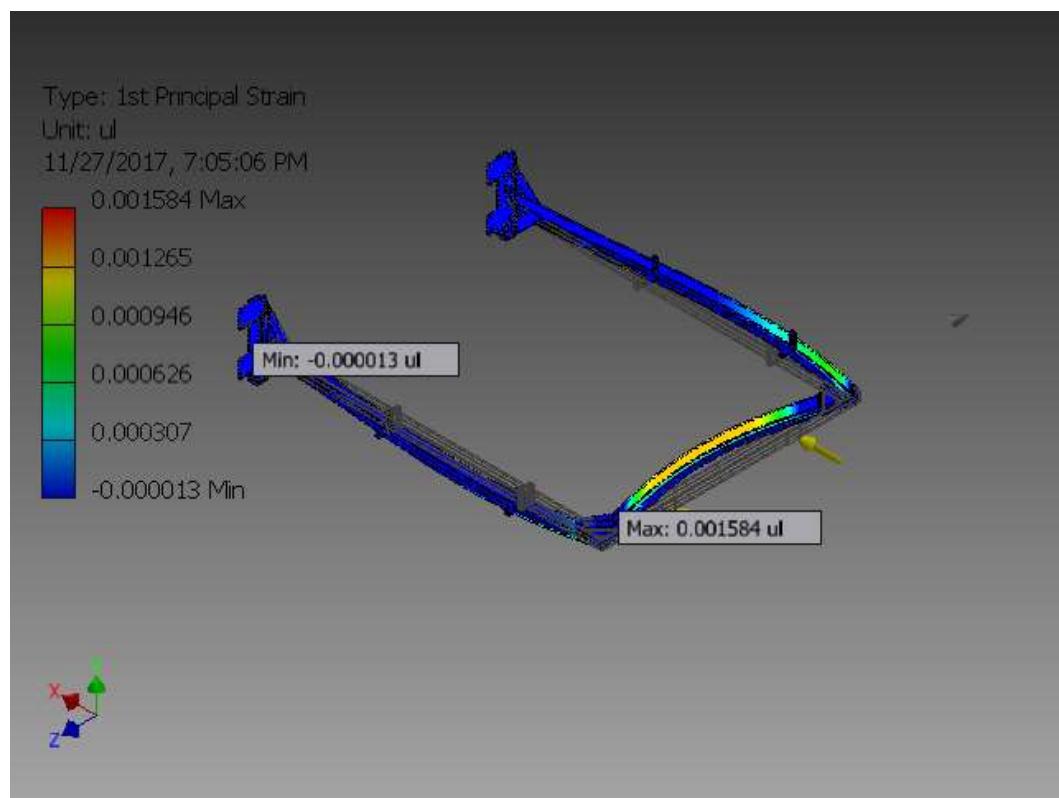
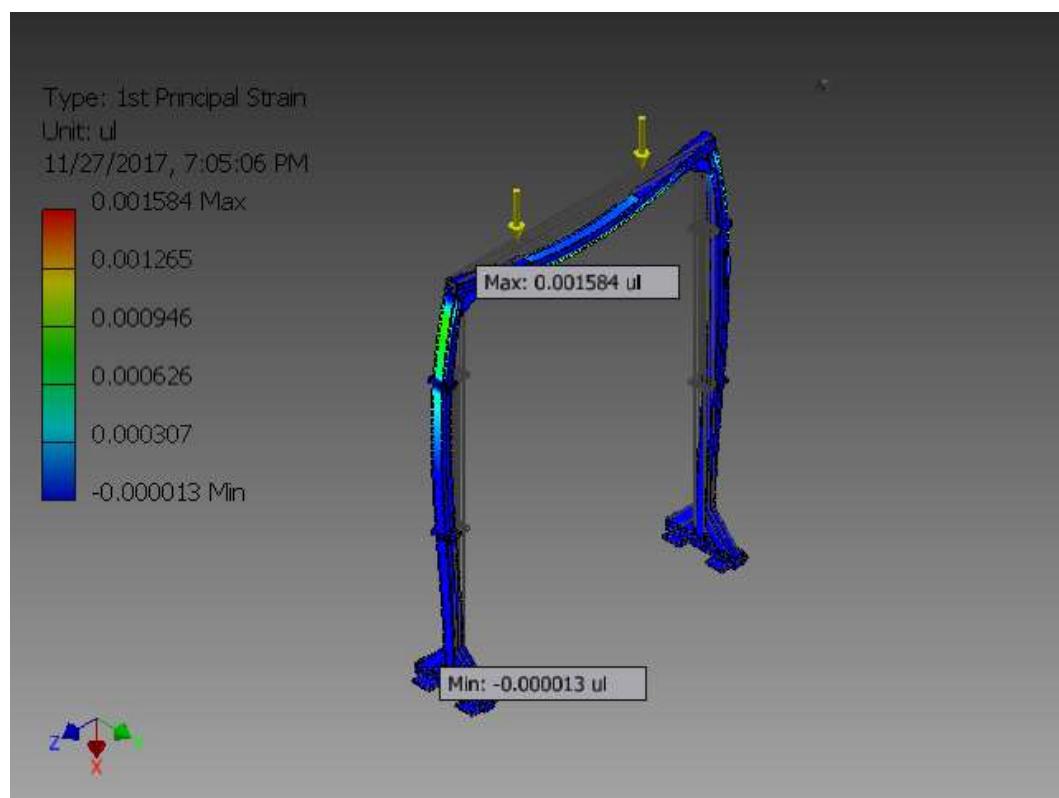
Z Displacement



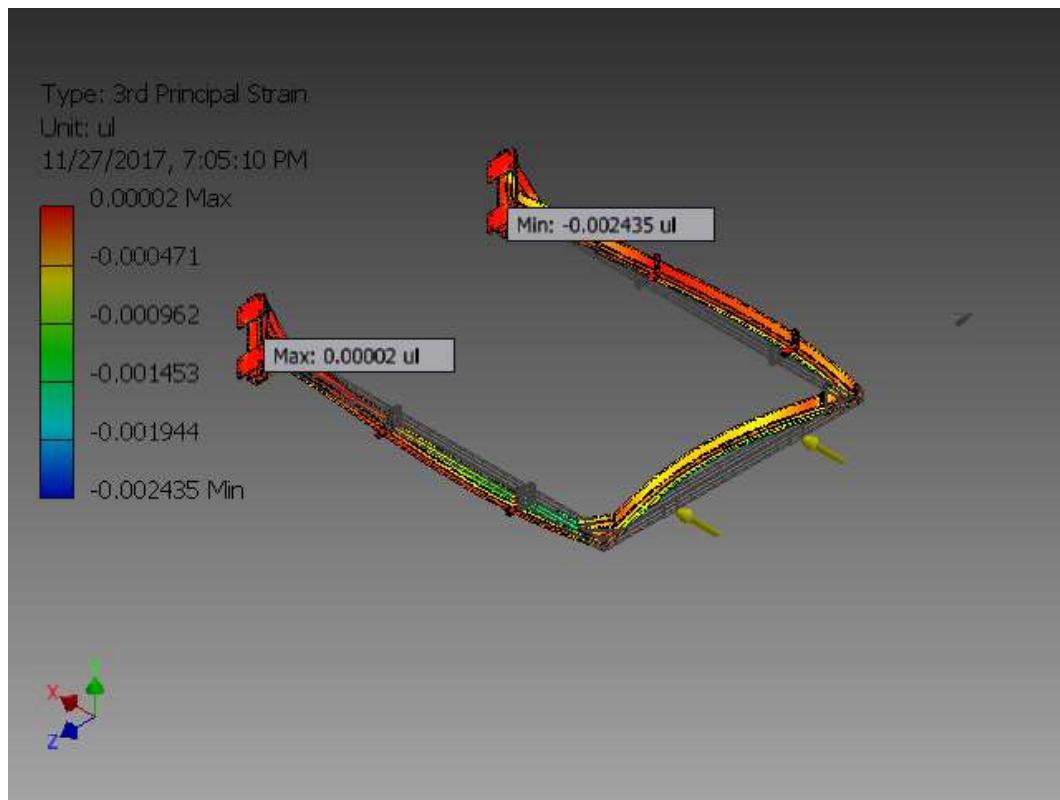
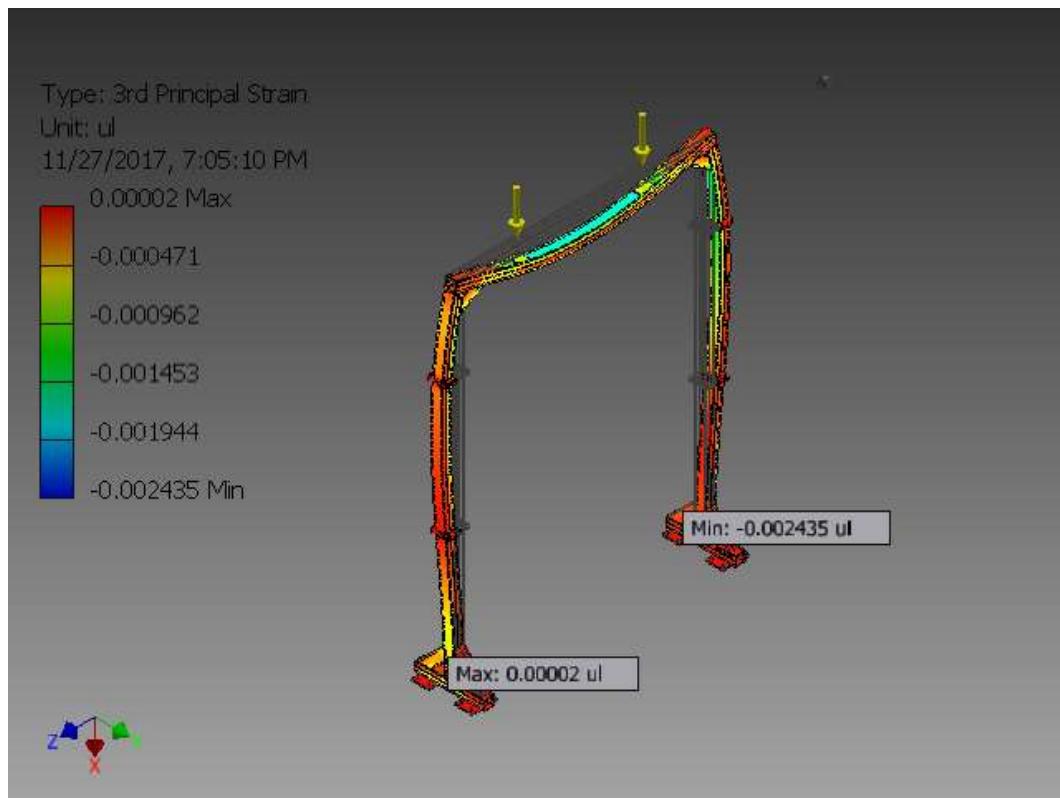
Equivalent Strain



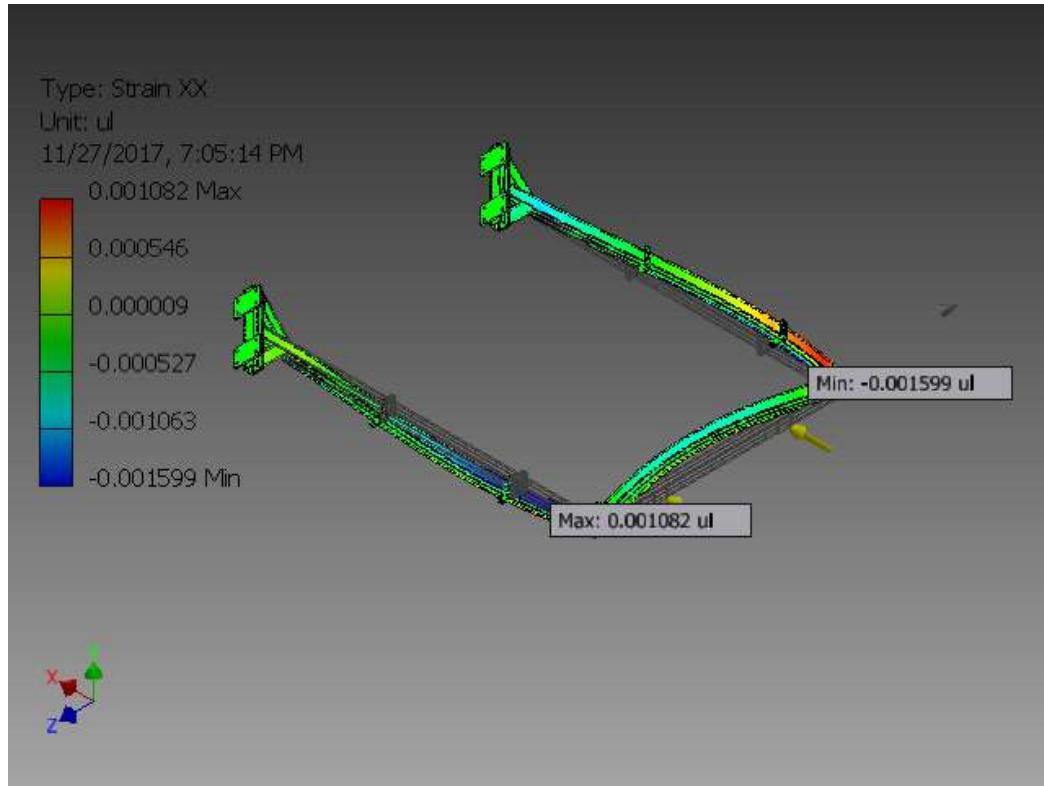
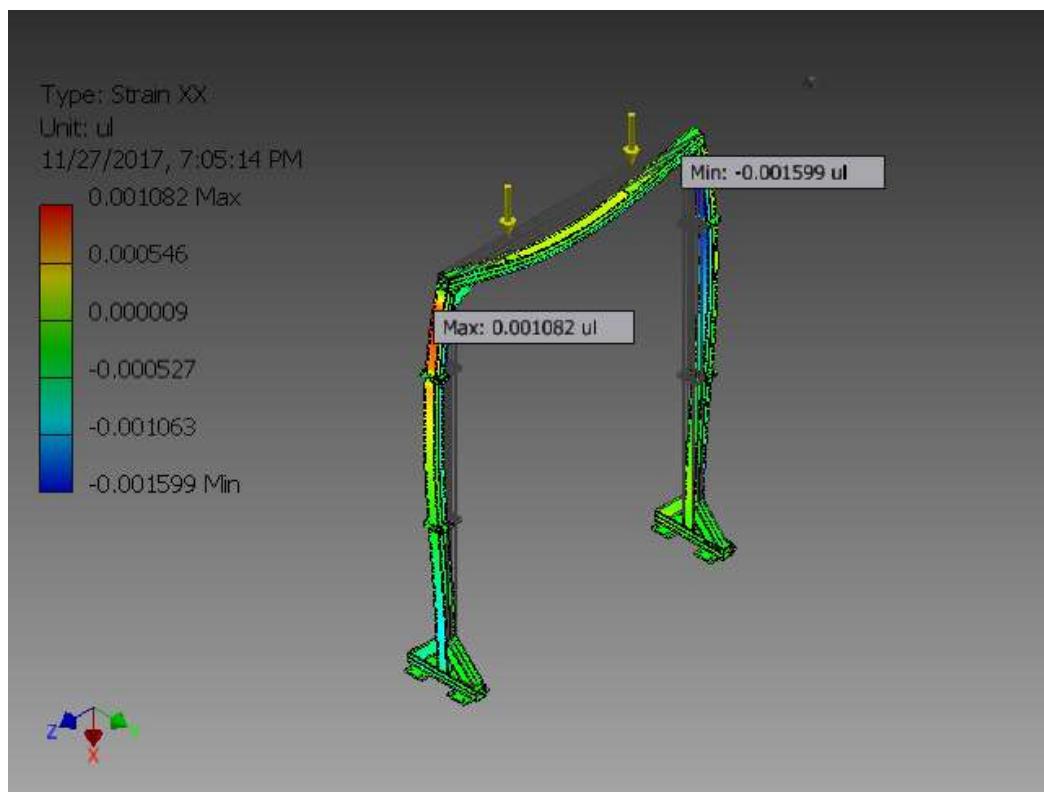
1st Principal Strain



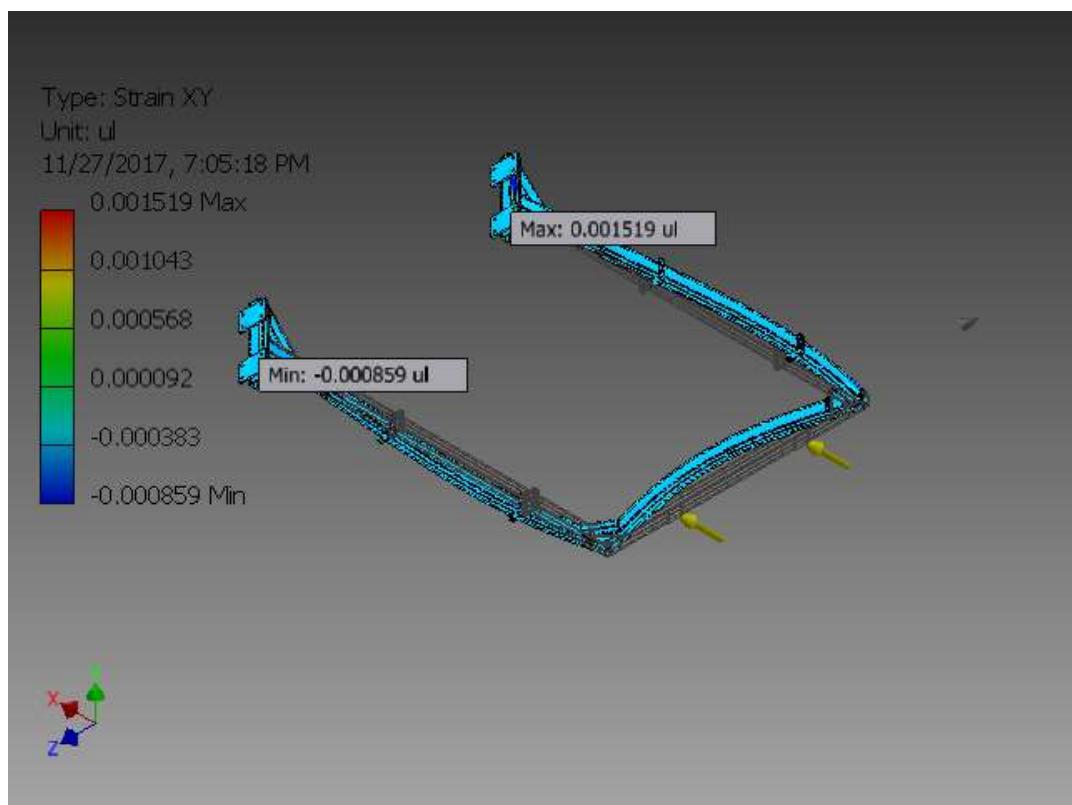
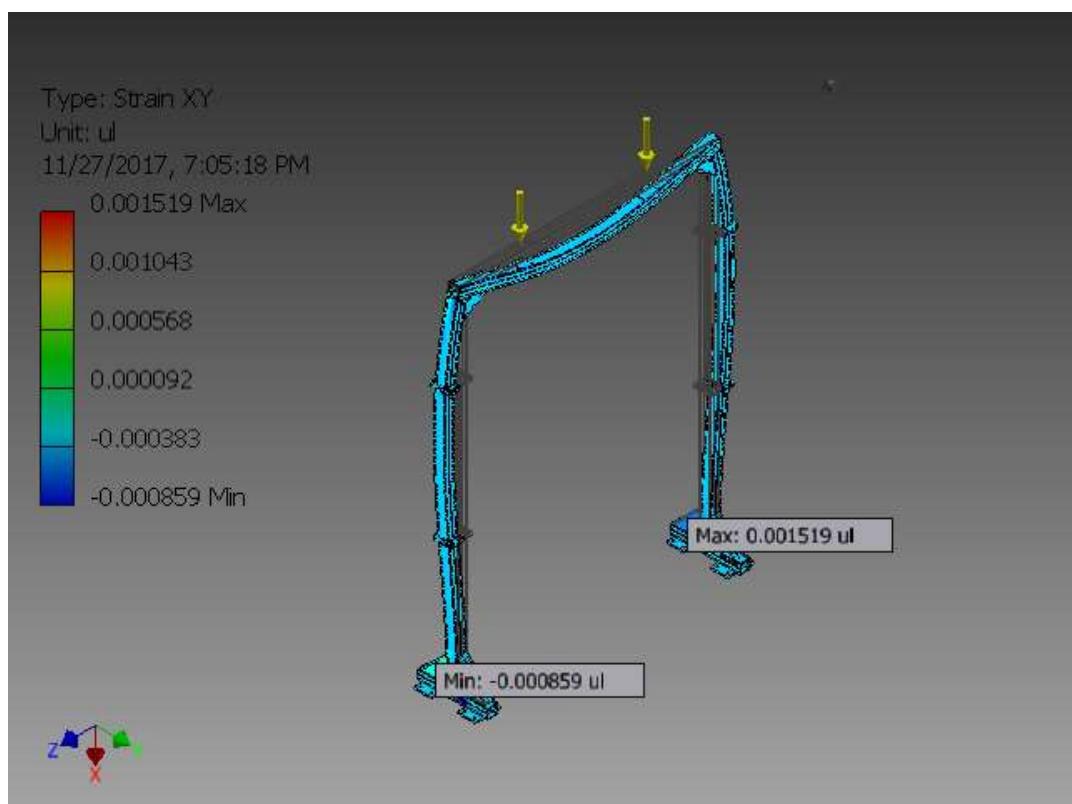
3rd Principal Strain



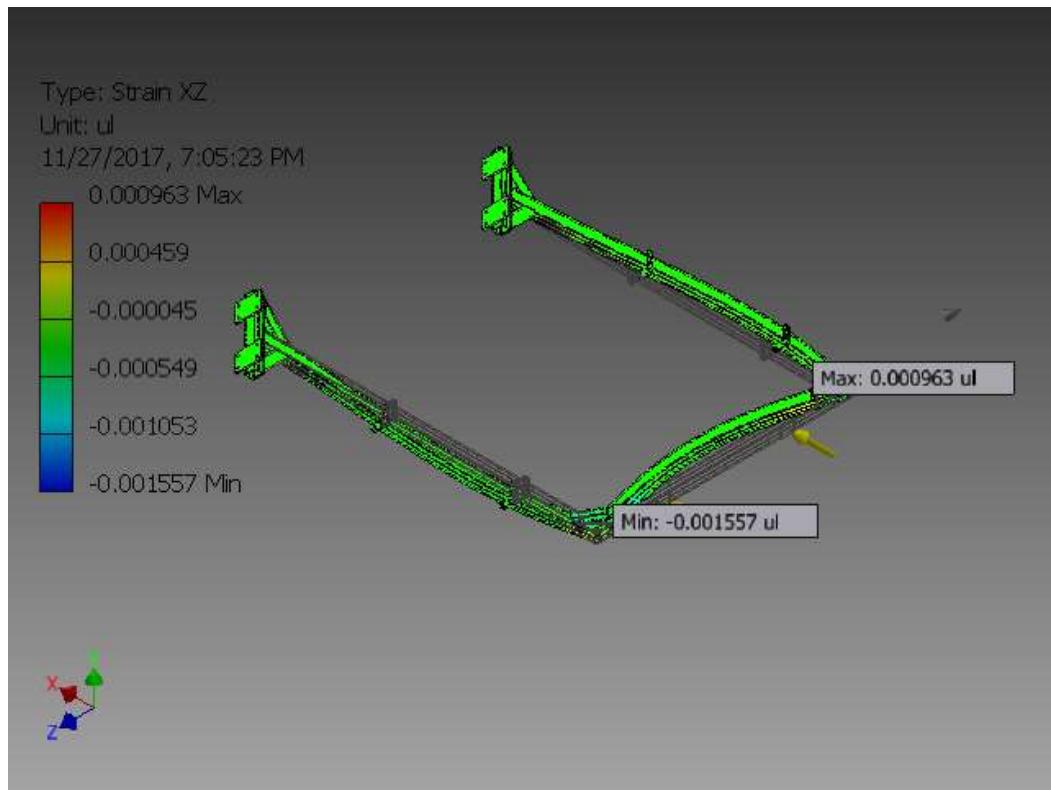
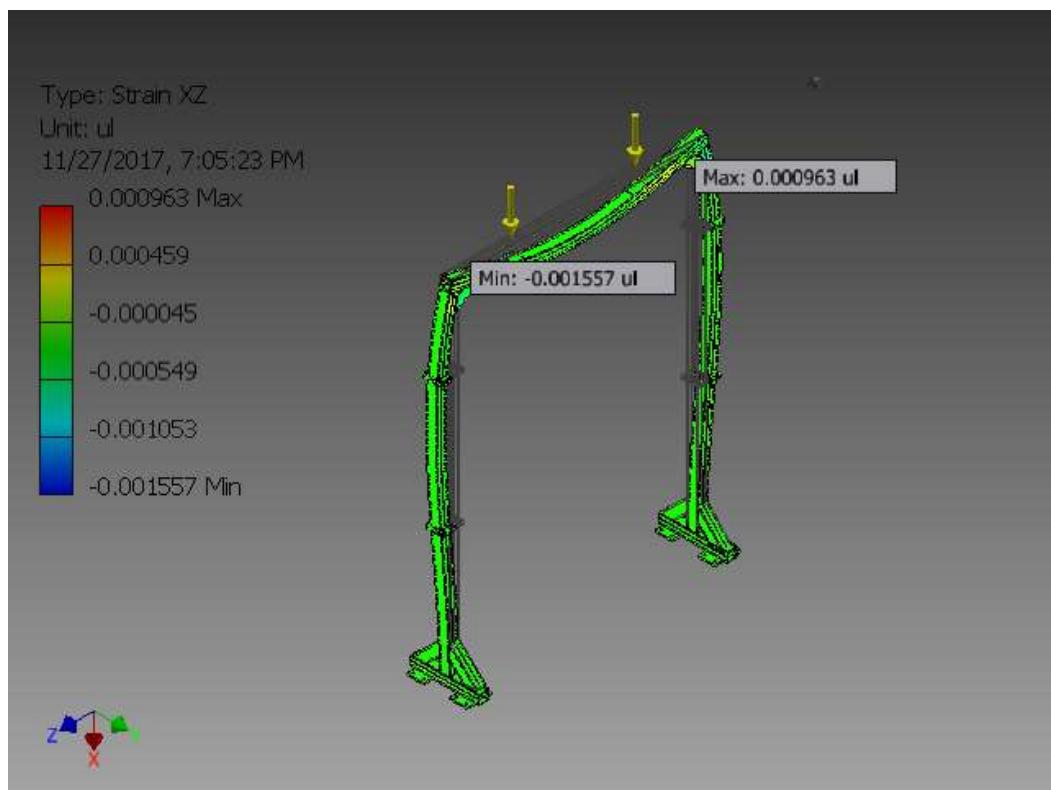
Strain XX



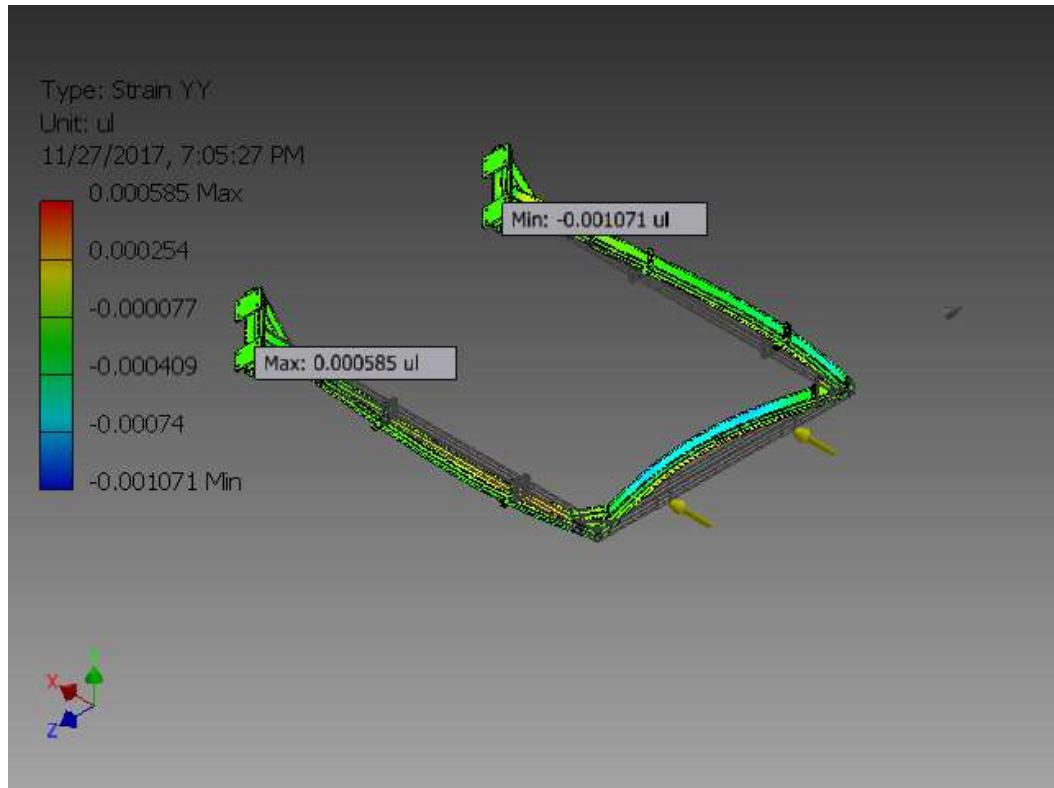
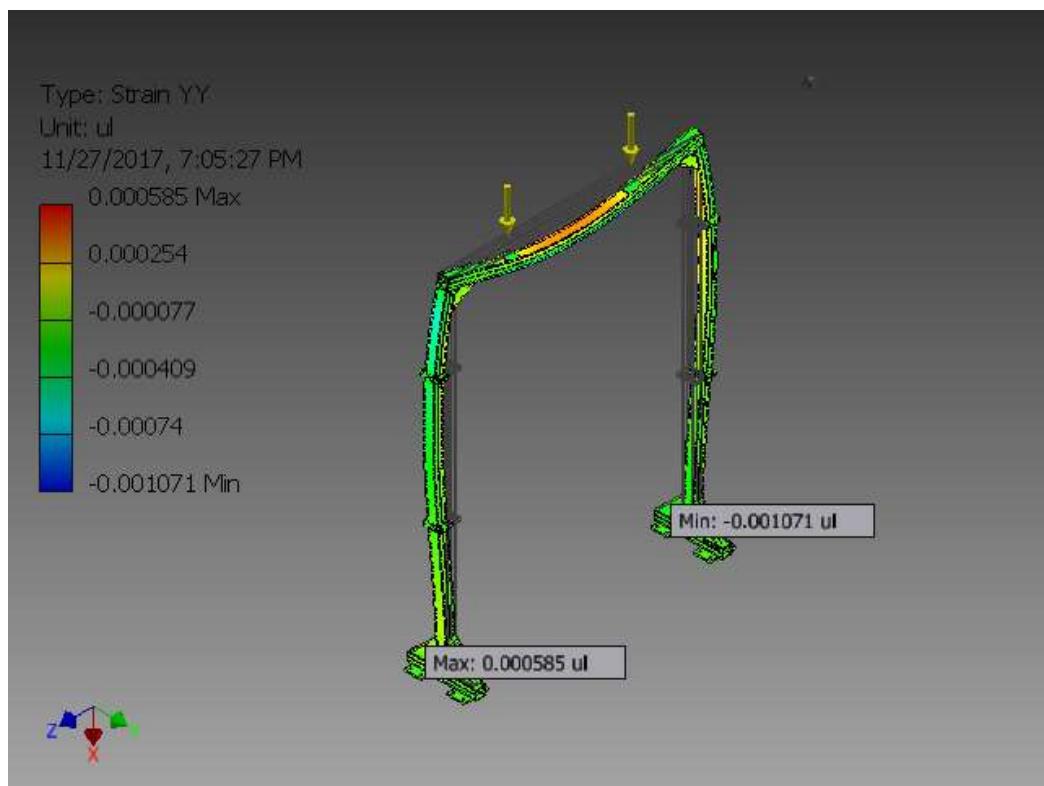
Strain XY



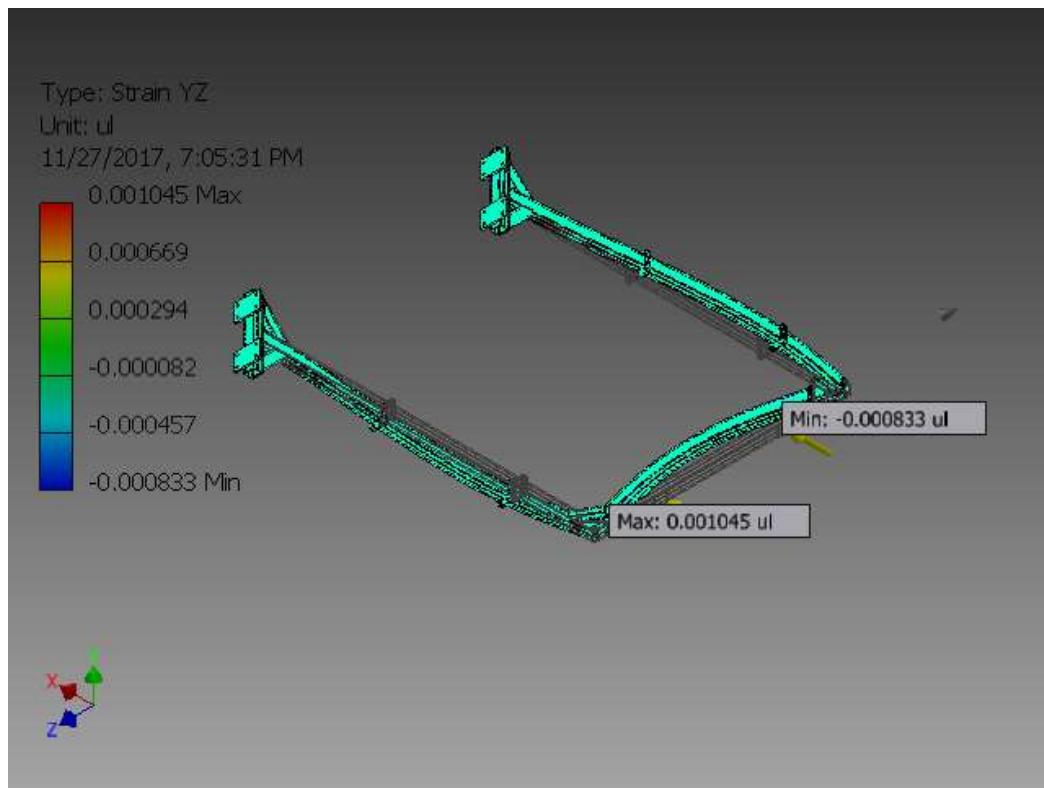
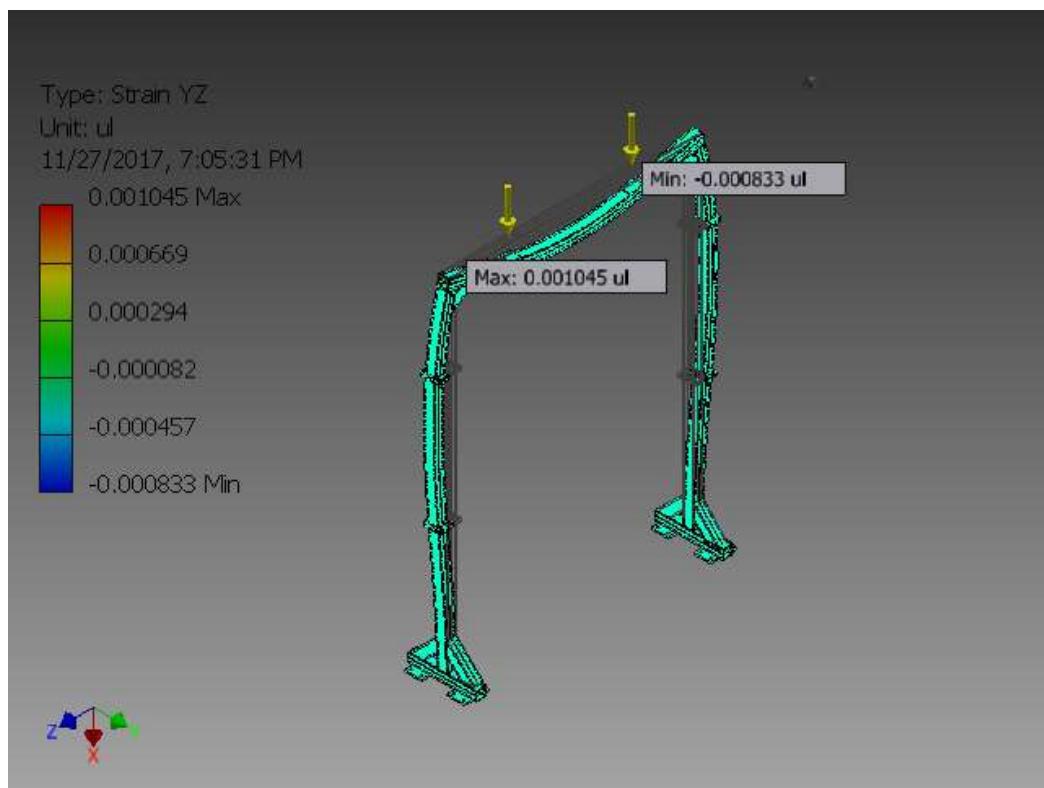
Strain XZ



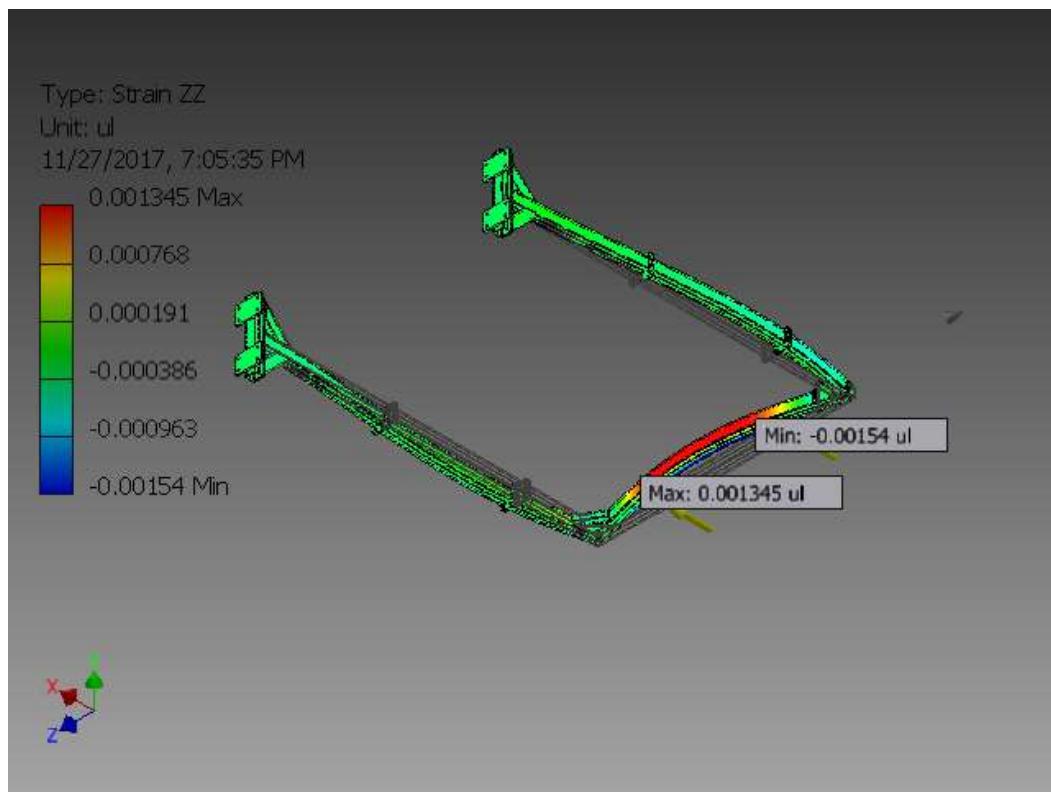
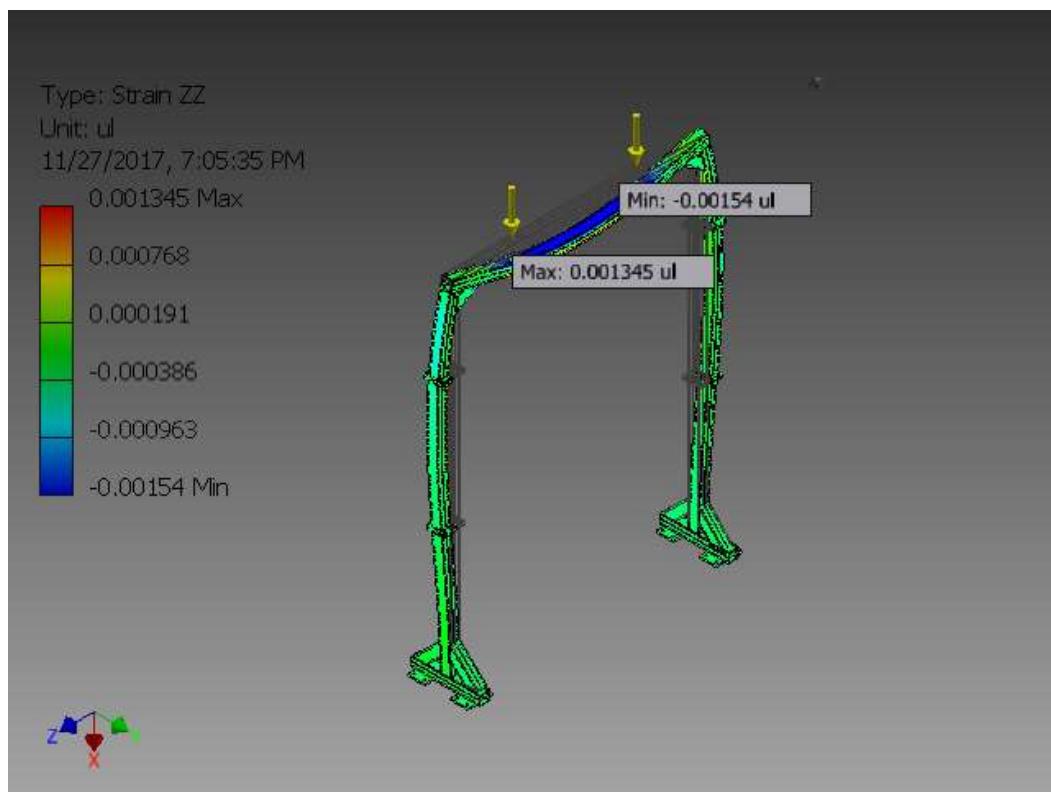
Strain YY



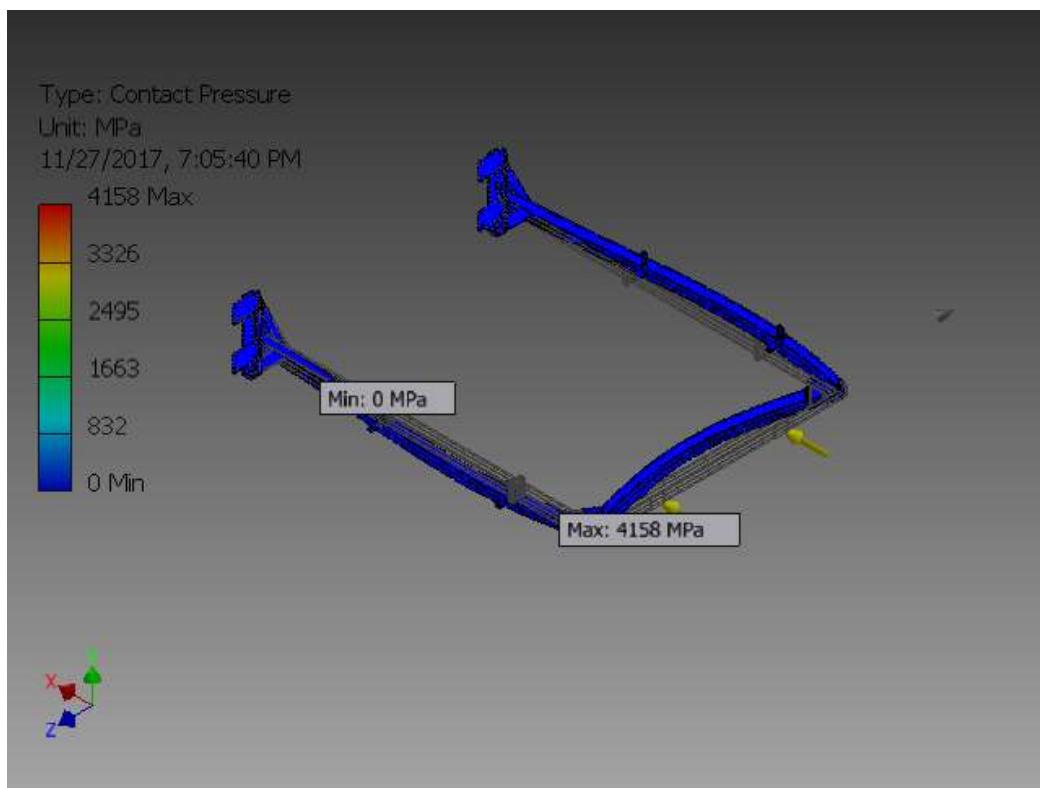
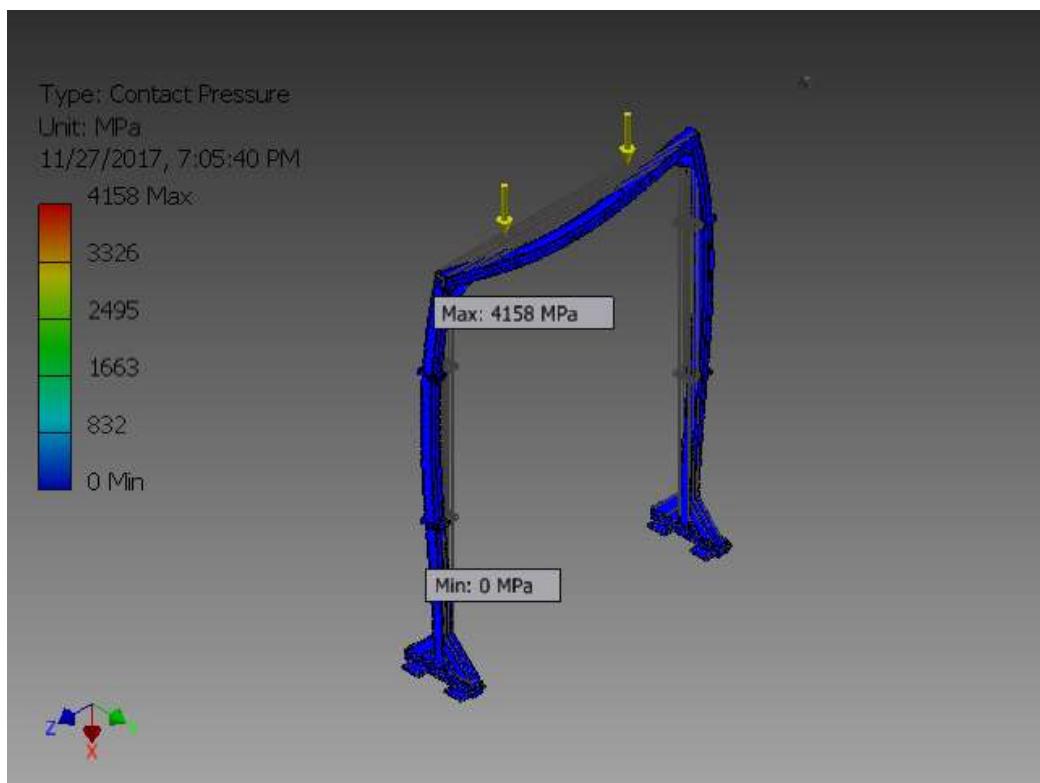
Strain YZ



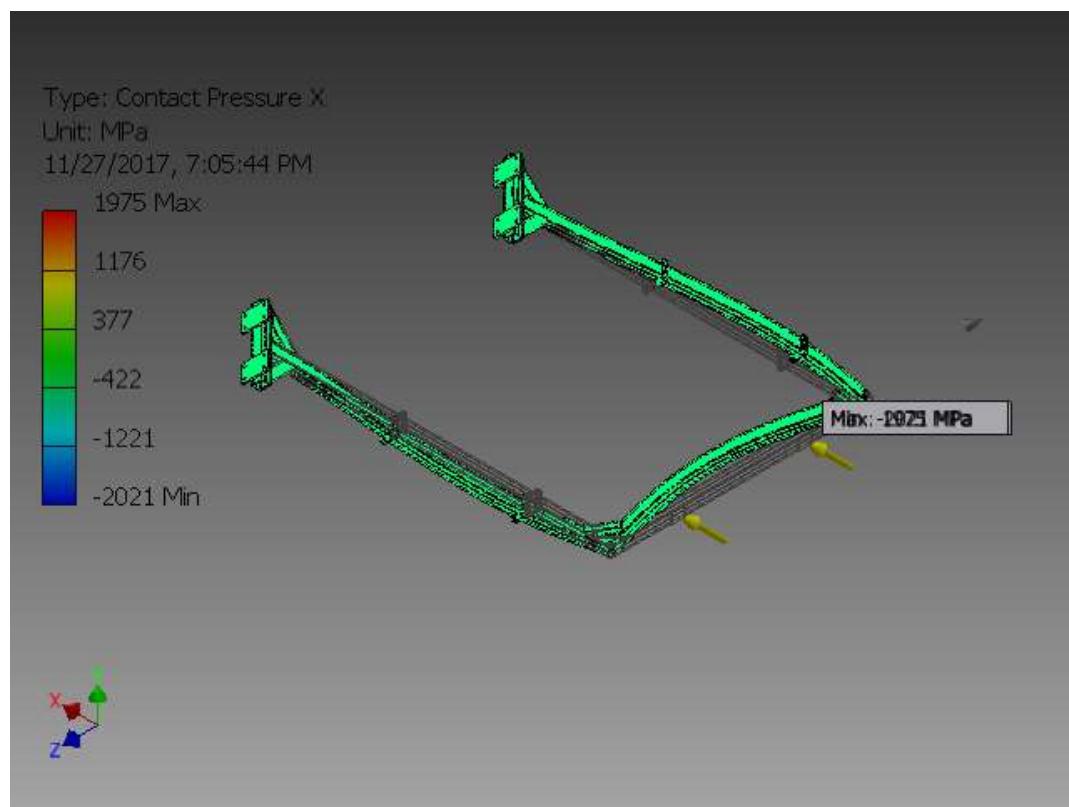
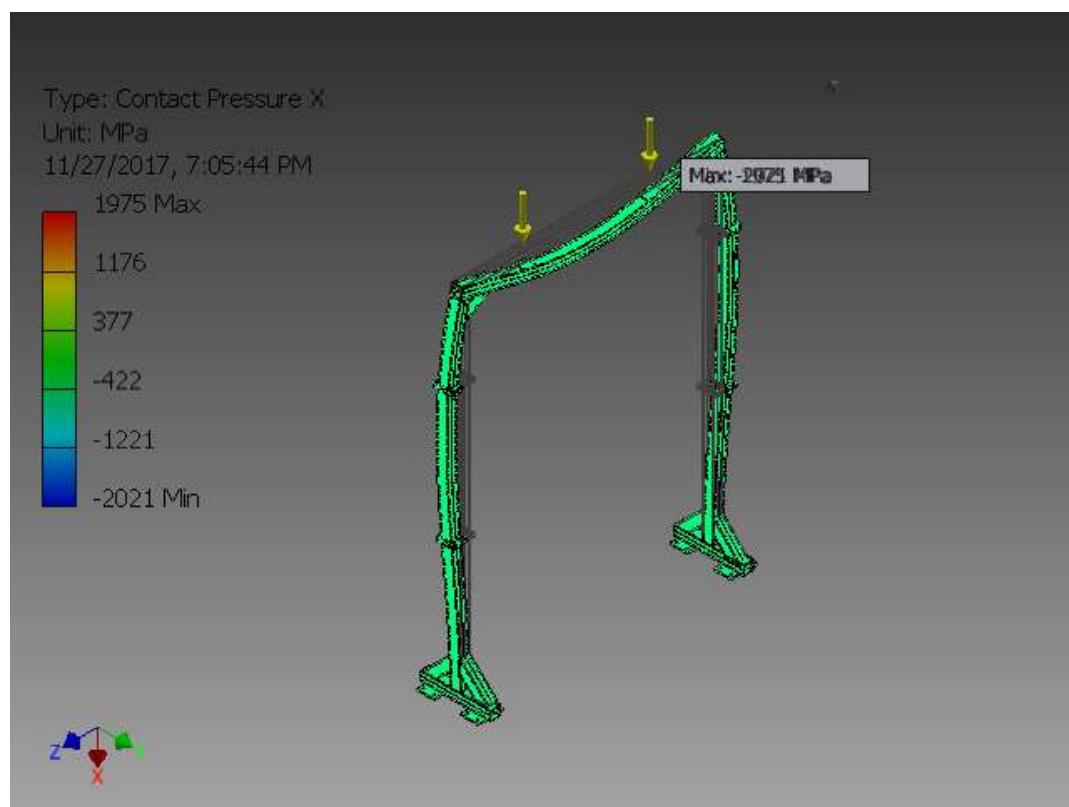
Strain ZZ



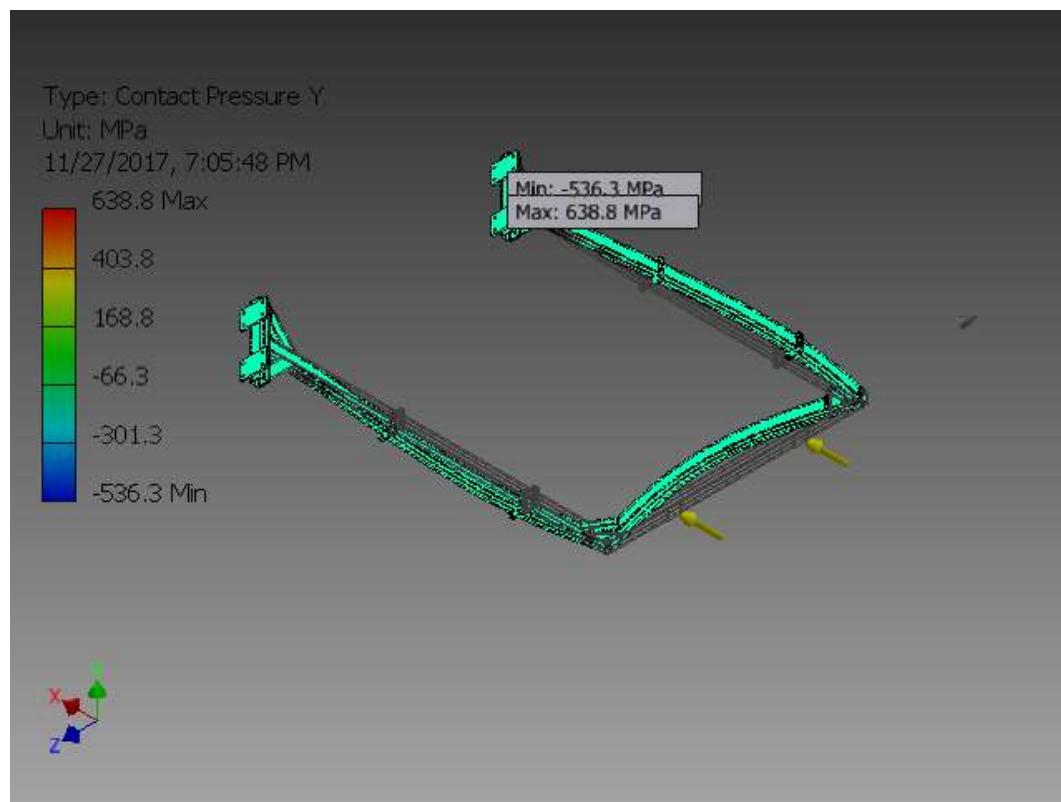
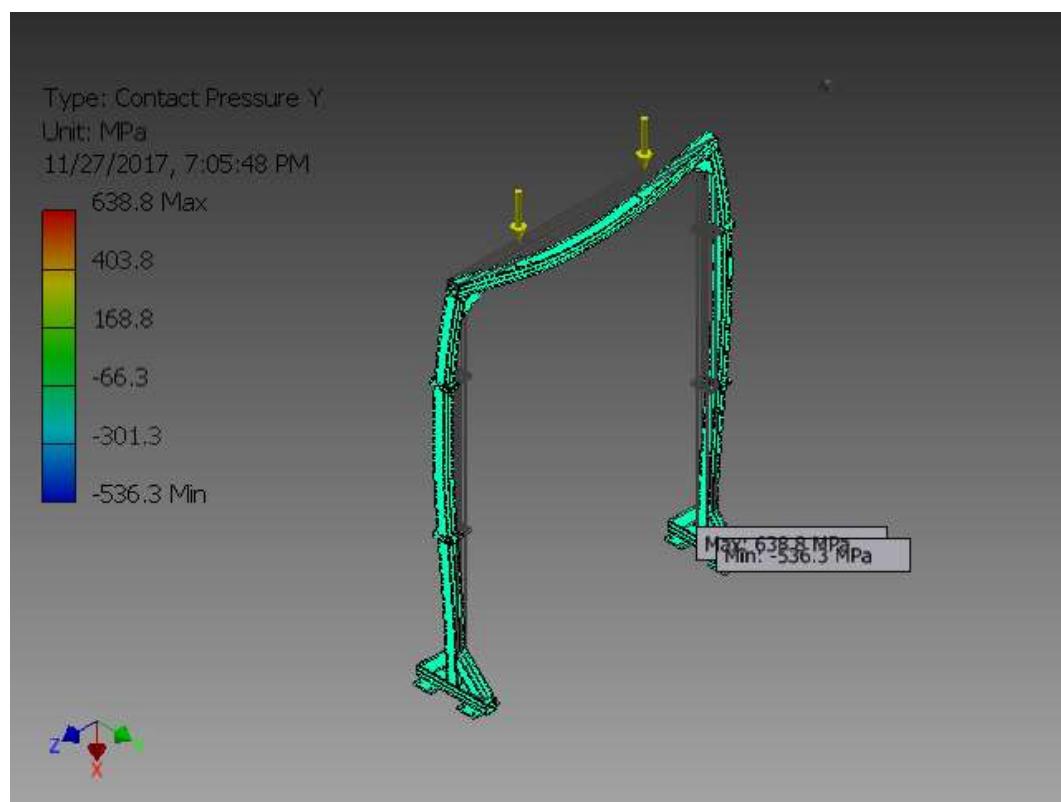
Contact Pressure



Contact Pressure X



Contact Pressure Y



Contact Pressure Z

